
This is a reproduction of a library book that was digitized by Google as part of an ongoing effort to preserve the information in books and make it universally accessible.

GoogleTM books

<https://books.google.com>



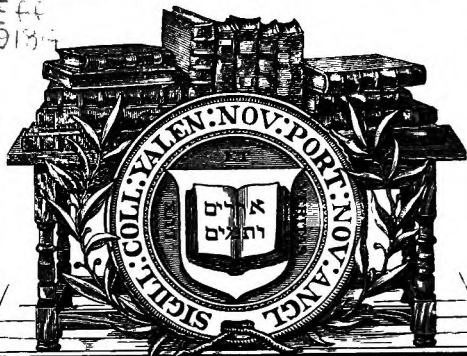
YALE UNIVERSITY LIBRARY



3 9002 06089 0986



E44
913.4



*"I give these Books
for the founding of a College in this Colony"*

• YALE UNIVERSITY •
• LIBRARY •

BOUGHT WITH THE INCOME
OF THE
Alfred E. Perkins Fund

1921

W. E. HARRIS, 1921

*This book was digitized by Microsoft corporation in cooperation with
in cooperation with Yale University Library 2009. You
may not reproduce this digitized copy of the book for
any purpose other than for scholarship, research,
educational, or, in limited quantity, personal use. You
may not distribute or provide access to this digitized copy
(or modified or partial versions of it) for commercial purposes.*

T.D. 1216

A HANDBOOK OF
KENYA COLONY
(BRITISH EAST AFRICA)
AND THE
KENYA PROTECTORATE
(PROTECTORATE OF ZANZIBAR)

*Prepared by the Geographical Section of the Naval
Intelligence Division, Naval Staff, Admiralty*

Gt. Brit. Admiralty

LONDON:

PUBLISHED BY HIS MAJESTY'S STATIONERY OFFICE.

To be purchased through any Bookseller or directly from
H.M. STATIONERY OFFICE at the following addresses:

IMPERIAL HOUSE, KINGSWAY, LONDON, W.C. 2, and

28 ABINGDON STREET, LONDON, S.W. 1;

37 PETER STREET, MANCHESTER;

1 ST. ANDREW'S CRESCENT, CARDIFF;

23 FORTH STREET, EDINBURGH;

or from E. PONSONBY, LTD., 116 GRAFTON STREET, DUBLIN.

Price 7s. 6d. net

Printed under the authority of
HIS MAJESTY'S STATIONERY OFFICE
By FREDERICK HALL at the University Press, Oxford.

NOTE

WHAT were formerly known as the East Africa Protectorate (more commonly British East Africa) and the Protectorate of Zanzibar were renamed, as from July 23, 1920, Kenya Colony and Kenya Protectorate respectively. At the same time the East Africa Protectorate became a Crown Colony. The text of this handbook had been set up before this change of names ; throughout the text therefore, the old forms have been retained, although the names Kenya Colony and Kenya Protectorate have been chosen for the title-page. The bulk of the book is occupied with Kenya Colony, the section dealing with Kenya Protectorate beginning on p. 509.

The material embodied in the book was collected during the Great European War, but owing to the dispersal of the Section a few months after the Armistice the business of getting it through the Press was entirely suspended. Subsequently it was considered desirable that the book should be proceeded with substantially as it stood at the time of the Armistice and it does not therefore profess to be completely up to date.

In the work of compilation the authors were indebted for much valuable information and many useful suggestions to Government Departments, the East Africa section of the Colonial Office, especially, and East African officials, settlers, and missionaries. The list of names of those who thus rendered assistance includes : Sir H. C. Belfield, K.C.M.G.,

late Governor of the Protectorate ; the Hon. B. Eastwood, late General Manager of the Uganda Railway ; the Hon. A. C. Hoey, Unofficial Member of the Legislative Council ; Mr. J. T. Gosling, Postmaster-General of the Colony ; Lt.-Col. Stordy, D.S.O., Chief Veterinary Surgeon of the Colony ; Lord Cranworth ; Major H. F. Ward ; the Rev. E. W. Crawford ; and Mr. A. R. Barlow.

CONTENTS

PART I

KENYA COLONY (BRITISH EAST AFRICA)

CHAP.	PAGE
I. PHYSICAL GEOGRAPHY	11
Situation, Area, Frontiers—General Description—The Coast— The Coast Plain—The Coastal Hills—The Nyika—The Eastern Highlands—The central highland plateau east of the Rift Valley—The western highlands and the Victoria Nyanza— Jubaland and the North Frontier Province.	
II. GEOLOGY	85
Coastal belt—The gneiss area (Nyika and eastern highlands)— The volcanic region (Highlands and Rift Valley)—The lake zone.	
III. CLIMATE	124
General—Regional.	
IV. VEGETATION	173
General—Tropical Coast—Nyika—Savannah—Highland forest —Moorland—Synopsis of Forest Rules.	
V. FAUNA	202
General—Mammals—Birds—Reptiles and Fish—Insect and other Pests—Appendix : List of Big Game Animals.	
VI. NATIVE POPULATION	233
Ethnology—Social Organization—Dwellings and Clothing— Tribes.	
VII. HARBOURS, TOWNSHIPS AND SETTLEMENTS	270
Part I, Ports and Coast Towns. Part II, Inland Towns and Settlements. Part III, Towns and Ports on the Lake.	

CHAP.	PAGE
VIII. HEALTH CONDITIONS	321
General Conditions of Health : (a) for Europeans, (b) for natives, (c) for Asiatics—Ordinances and Rules concerned with the public health—List of Hospitals, Dispensaries, Medical officers and Sanitary Inspectors—Sanitation—Prevalent diseases—Diseases of animals—Water supply.	
IX. COMMUNICATIONS	347
Waterways—General description of roads—Transport—Main communications with surrounding countries—Coastal region—Taru desert—Voi-Taveta road and connected tracks—Note on Lake Jipe and the Pare Mountains—Eastern highlands—Rift Valley and western highlands—Lake district—Northern Frontier Province and Jubaland.	
X. ECONOMIC GEOGRAPHY	381
Coastal belt—Nyika—Highlands and Rift Valley—Lake Zone—Jubaland and North Frontier Province—Mineral resources.	
XI. INDUSTRIES	394
Agriculture—Principal economic crops—Forest products—Stock breeding—Principal live-stock—Animal products—Fisheries—Mining.	
XII. TRADE MANUFACTURES AND LABOUR	452
Imports—Exports—Re-exports—Transit—Local trade—Manufactures—Banks—Labour.	
XIII. GOVERNMENT AND ADMINISTRATION	470
Home government—Local central government—Provincial government—Administrative divisions—Justice—Revenue and expenditure—Military and police—Land tenure—Currency, weights and measures.	
XIV. HISTORY	481

PART II

KENYA PROTECTORATE
(PROTECTORATE OF ZANZIBAR)

CHAP.	PAGE
I. GENERAL DESCRIPTION	509
Area—Population—Zanzibar town and harbour—Government and administration.	
II. PHYSICAL GEOGRAPHY, VEGETATION AND FAUNA	518
Zanzibar Island—Tumbatu, Uzi and Latham Islands—Pemba Island—Vegetation—Fauna.	
III. INDUSTRIES	553
Agriculture—Stock breeding—Fisheries—Animal products—Mining—Trade statistics.	
IV. HISTORY	571
APPENDIX.	
A. Administrative Divisions and Population Statistics	581
B. Climate Tables	583
C. Missions in British East Africa	642
INDEX '	643

MAP

Kenya Colony (British East Africa)

PART I

KENYA COLONY

(BRITISH EAST AFRICA)

CHAPTER I

PHYSICAL GEOGRAPHY

Situation, area, frontiers—General description—The coast—The coast plain—The coastal hills—The Nyika—The eastern highlands—The central highland plateau east of the Rift valley—The Rift valley—The western highlands and the Victoria Nyanza—Jubaland and the North Frontier Province.

SITUATION, AREA, FRONTIERS

BRITISH EAST AFRICA is situated between latitude $4^{\circ} 40'$ south and $4^{\circ} 20'$ north, and longitude 34° east and $42^{\circ} 40'$ east. Together with Uganda, it is the only portion of the British Empire through which the equator passes. It contains an area of 246,822 square miles, rather more than twice that of Great Britain. It is bounded on the south by Tanganyika Territory,¹ on the west by Uganda, on the north by Abyssinia, on the north-east by Italian Somaliland, and on the east by the Indian Ocean.

The frontier-line dividing British East Africa from Tanganyika Territory starts from the coast at the mouth of the Uмба river, and strikes in a straight line north-west to Lake Jipe. For 130 miles the mountain ranges of Usambara and Pare run parallel with it on the southern side. On the northern side, except in the neighbourhood of the coast, is a waterless, bush-covered, and practically uninhabited desert.

At Lake Jipe the frontier turns NNW., following the centre of the lake to its northern shore, and then forms

¹ That part of what was German East Africa, for which Great Britain has received a mandate, has been renamed Tanganyika Territory.

a salient into Tanganyika Territory, some 15 miles across at its base, between the northern end of the Pare mountains on the south, and the foothills of Kilimanjaro on the north. The southern side of the salient is the river Ruwu, from the point where it issues from Lake Jipe to its junction with the river Losoyai, which enters it from the north. The Ruwu forms an impassable barrier, being unfordable and full of crocodiles, while along its northern bank are vast swamps. At the mouth of the Losoyai the frontier turns in a northerly direction for about 2 miles, after which it curves out towards the west to form the apex of the salient in a region of dense forest. Curving round from here to the north-east it crosses the steep and densely wooded Kitowo Hills and continues to the south-eastern spur of Kilimanjaro, where the salient ends in the crater lake of Chala, 1,040 ft. above the plain. From Lake Chala the frontier runs NNW. to the post of Useri. Here it resumes its original north-westerly direction and runs in a straight line to the Victoria Nyanza.

The deviation of the frontier from Lake Jipe to Useri leaves Mount Kilimanjaro in Tanganyika Territory. This mountain is the greatest in all Africa, rising to a height of 19,705 ft. from a plain which lies about 3,000 ft. above sea level. The northern slopes of Kilimanjaro over which the frontier passes are an open grass veldt studded with small crater-shaped hills. North-west of the mountain the frontier crosses a region of swamps which vary greatly in extent according to the season. Wide dry beds lead down to them which in the rains become torrents, so that this stretch of the frontier is at one time a desert and at another a sea of mud. From here the frontier continues over the plateau of the Matumbatu Masai which is much broken up by hills and mountains, the most important being Ol Donyo Erok (7,221 ft.). The frontier crosses its southern slopes opposite the solitary mountain of Longido (8,556 ft.), 11 miles within Tanganyika Territory.

The eastern edge of the Rift Valley is reached at Kilibei Hill. Descending the escarpment to the floor of the valley the line passes along the northern shore of Lake Natron,

and then ascends the western wall which is here known as the Nguruman escarpment. From the summit of this, the country traversed by the frontier slopes down from the lofty tableland of Ndasegara (8,300 ft.) over a succession of wooded ridges to the wide valley of the river Mara, a swift and unfordable stream, 50 yds. wide, and 20 ft. deep in the rains at the point where the line crosses it. On the other side of this valley rises the Isuria escarpment, running north-east and south-west, over 6,000 ft. in height. From the summit of the Isuria escarpment the levels continue to fall to the shores of the Victoria Nyanza. The frontier line strikes the lake just south of the rocky promontory of Mohuru, and continues into the lake as far as the point where latitude 1° south intersects with longitude 34° east. This marks the junction of the frontiers of British East Africa and Tanganyika Territory, and Uganda.

The administrative frontier dividing British East Africa from Uganda runs from this point to the most westerly of the islands of Ugingo, thence to the most westerly of the isles adjacent to Mfwanganu, a large island off the mouth of the Kavirondo Gulf, thence to the western end of Mageta Island, thence to the centre of the channel on the west side of Sumba Island at the entrance of Berkeley Bay, and thence to the mouth of the Sio river. The frontier follows the course of the Sio north-east to its junction with the Sango river, thence almost due north up the valley of the Sango to the Mumias-Busia road, thence NNE. along the Busia-Mbale road to the point where it crosses the Malaba (Malawa) river, thence north-eastwards up the Malaba to its source on Mount Elgon. The frontier passes over the summit of Mount Elgon, and follows the course of the Turkwel river to its mouth on the western shore of Lake Rudolf. This river runs north-east as far as its junction with the Weiwei river, then north for about 60 miles, then north-east for about 20 miles, and after that almost due east for about 40 miles, till Lake Rudolf is reached.

The frontier turns due north up the centre of the lake to the point of intersection of latitude $4^{\circ} 34'$ north with longi-

tude 36° east. This is the meeting place of the frontiers of British East Africa, Uganda, and Abyssinia.

The frontier separating British East Africa from Abyssinia strikes the east shore of Lake Rudolf at a point due west of the south end of Lake Stephanie. Between the two lakes, the frontier forms an obtuse angle, with Gara Goya (2,960 ft.) as the apex. The bed of Lake Stephanie is only about one quarter covered with water, which is undrinkable by man or beast, and at certain seasons almost entirely dries up. The frontier traverses the southern end of this bed as far as and including the springs in a creek at the south-east corner of the lake. Thence it strikes south-east across the Eil Dima Hills, over the summits of Gara Afurr (6,319 ft.) and Gara Burrchuma. South of these two mountains is Gara Jubissa (5,563 ft.), divided from them by a low neck known as the Sele Gubro Pass. From the Eil Dima Hills the frontier continues in a straight line south-east, the country on each side being an undulating bush-covered plain, waterless except in the rains. Here and there the plain is broken by isolated hills, such as Gara Furroli and Gara Dimtu, over the summits of which the frontier passes. Just beyond the latter the frontier line takes an easterly direction. At Uran it strikes the Goro escarpment, which here comes down from the north-west and bends round towards the east. At first the frontier follows the foot of this escarpment crossing the many spurs which project from it, but ascends to its summit at Churre Moyale, situated at an altitude of 5,000 ft. Eastwards from Churre Moyale the line follows the escarpment to the summit of a projecting spur known as Gara Roka. Here it leaves the escarpment, and strikes due east to Gara Kuffole, one of many isolated hills, rising from a bush-covered plain. Thence it turns north for about 20 miles, and then NNE. through thick bush country to the cairn on the Chillako road immediately north of Eil Mole. From here the frontier runs in a straight line ENE. for about 30 miles, and then due east until it strikes the river Daua, at Ursulli, immediately upstream from Malka Murri, passing through a level bush-

covered plain with few open spaces. From Gara Kuffole to Ursulli the frontier follows the tribal limits between the Gurre and Borana. Between the Daua and Lake Rudolf the only permanent water on the British side of the frontier is at Ramut, Moyale, and Holali. The Abyssinians dispute the possession of the wells at Garar, near Gaddaduma. The Daua at Malka Murri is 25 yds. broad and 18 in. deep. It occupies a narrow valley, is nowhere deep, and can be forded in many places. It flows in an easterly direction as far as Mandaira, and then north-east. The frontier follows the course of this river to its junction at Dolo with the Ganale. From this point the united streams are known as the Juba. Here the Abyssinian frontier ends, and the river Juba down to the Indian Ocean forms the dividing line between British East Africa and Italian Somaliland.

GENERAL DESCRIPTION

If a line be drawn from the south shore of Lake Rudolf to the sea coast north of the Lamu Archipelago, the country will be divided roughly into two halves. While to the south of this line there is every variety of country and scenery, to the north of it there is for the most part nothing but monotonous steppe-desert, hot, sandy, covered with bush, and badly watered. Here there are no well-defined zones, and few prominent natural features, only a vast undulating plain sloping continuously upwards from the sea coast to the north-west, and reaching an altitude of some 3,000 ft. at the foot of the Goro escarpment on the Abyssinian frontier. To the north-east it is continuous with the deserts of Somaliland, and westwards it extends past Lake Rudolf to the Nile, separating the highlands of British East Africa to the south from those of Abyssinia to the north. To this desert country the term *nyika* is generally applied. The desert or *nyika* is, however, by no means confined to this northern half of the country, for a broad tongue intrudes southwards through the whole length of the Protectorate as far as the Usambara and Pare mountains beyond the frontier. This southward exten-

sion of the nyika varies in breadth from 200 to 120 miles, and thus a wide arid bush-covered belt separates the highland plateau to the west from the narrow and fertile strip, hardly anywhere more than 15 miles wide, which lies along the coast from Lamu to the mouth of the Uмба river.

This part of the nyika is, however, not so completely a desert as the vast area to the north of it. The natural fertility of its soil is so great that it would be more properly described as undeveloped rather than desert land. It is also traversed by two large rivers, the Tana and the Sabaki, the floods from which fertilize the country on either side of their banks.

South of the arbitrary line from Lake Rudolf to Lamu, British East Africa presents in a striking manner those general features which persist almost continuously throughout East Africa from the Cape to Abyssinia, that is to say a series of parallel mountain ranges rising in tiers from the coast to a great elevated inland plateau, the whole land mounting steadily upwards to this highland region which stretches like a broad back along the continent. The northern half of British East Africa, as already shown, forms a big gap in this general system, the highland plateau being broken through by the desert to rise again in Abyssinia.

The southern half of the Protectorate falls clearly into well defined belts or zones, strikingly unlike one another in character. The first belt is the coast plain, where the soil is rich, the climate damp and warm, and the vegetation luxuriant. West of this, and separated from it in places by ranges of hills, and in places by a more or less steep slope, is the broad desert belt of the nyika which has already been described as extending through British East Africa from north to south. Beyond the nyika is the highland plateau, some 300 miles broad, and from 200 to 500 miles from the sea. Its general elevation, from 4,000 to 8,000 ft. above sea-level, greatly modifies the climate one would expect to find in a region situated on the equator, and renders large tracts of it suitable for European settlement. On the west

it slopes down to the Victoria Nyanza, which is largely a collection of waters which flow from it. Northwards the general level of the plateau declines into the desert towards Lake Rudolf.

From these vast elevated plains rise huge volcanic mountains of enormous dimensions, both in height and in area covered. The most conspicuous are Mount Kilimanjaro to the south across the frontier, Mount Kenya on the eastern, and Mount Elgon on the western edge of the plateau. The highlands of British East Africa might almost be said to be contained within a triangle formed by these three mountains.

The plateau is divided from north to south by the deep trench of the Rift Valley, which extends from latitude 15° S. to latitude 30° N., that is to say, from Rhodesia to the north of Palestine, a distance of 3,500 miles. Almost at its outset the valley forks, one branch proceeding north-west and forming the Central African Trough with its long narrow lakes such as Tanganyika, and for several hundred miles the valley of the Upper Nile: the other or main branch trends north. The Rift Valley of British East Africa is a small portion of this main valley. It is a strip of sunken land, representing what was once the highest ridge or anticlinal arch of the highland region, which subsided on the cessation of volcanic activity (see 'Geology'). Magnificent escarpments wall in the valley on either side. The crests of these escarpments form lines of high ground from which the land slopes down east and west. The width from crest to crest of the escarpments is on the average about 70 miles, and that of its floor 40 miles. The depth varies from 1,200 to 2,000 ft., the bottom rising and falling in a succession of basins occupied by lakes and separated by divides. The floor of the valley rises steadily from Lake Natron on the frontier at 2,000 ft. above sea-level to the neighbourhood of Lake Naivasha when it reaches its greatest elevation of 6,135 ft., and thence sinks down almost continuously to Lake Rudolf the altitude of which is 1,250 ft. Thence it is continued northward by a long strip of lowland, dotted with lakes, and in places below the level of the sea, through Abyssinia to the southern end of the

Red Sea. The Red Sea is itself part of the Rift Valley, repeating on a larger scale the structure of the long narrow lakes of Central Africa. From the northern end of the Red Sea the trough is continued up the gulf of Akaba, and thence to the Dead Sea and the Jordan valley.

In the detailed description of the country which follows, the coast will be treated first, then the southern half of the Protectorate, which is divisible into the following zones or belts—the coast plain, the coastal hills, the nyika, the eastern highlands, the Rift Valley, and the western highlands with the littoral of the Victoria Nyanza: and finally the northern half of the Protectorate, consisting of Jubaland and the North Frontier province.

THE COAST [See 'Ports and Coast Towns', p. 270]

The coastline of British East Africa is about 400 miles in length. From the mouth of the Umba on the southern frontier to the mouth of the Tana in Formosa Bay, a distance of approximately 160 miles, its direction is NNE. and SSW., and thence to the mouth of the Juba on the frontier of Italian Somaliland, north-east and south-west.

The general appearance of the coast is flat and low. It is deeply indented with numerous winding creeks and estuaries, often running inland for considerable distances, and usually belted with dense fringes of mangrove. There is, however, very little mangrove to the north of Kiunga, which is a few miles to the south of the boundary of Jubaland Province. In places the branches from one estuary have united with those from another. All the islands off the coast, south of and including the Lamu Archipelago, have been formed in this way, and were once part of the mainland.

The southern part of the coast from the frontier to as far north as Gazi is low and wooded. Occasional clumps of trees, and islands lying off the coast, stand out with some prominence from the monotonous dead level. There are several small streams navigable for a mile or so by the smaller class of dhows. Numerous creeks run up into the land, lined with thick

fringes of mangrove. The southernmost of these mangrove-lined waterways is the river Yimbo or Jimbo, 200 yards across at its entrance, and forming part of the delta of the river Umba. A second entrance to the river Umba lies $1\frac{1}{4}$ miles farther up the coast. The ruins of the old town of Vanga lie just within the entrance on the southern bank. The present town is on the same bank a little farther up. Two miles north of this second entrance is a third, which unites with the second 2 miles from the sea, at the large village of Mgoa. At low water the Umba is dry down to the sea, and even at high tide is only navigable by dhows as far as Mgoa.

Between Vanga and Wasein Island to the east a bay is formed, having in its centre Sii Island, which is uninhabited, and thickly wooded with mangrove trees. The eastern side of the bay is the broad peninsula of Shimoni, between the estuaries of the Mwema and Ramisi rivers. Off the southern end of this peninsula is the coral island of Wasein, 3 miles in length in an east and west direction by 1 mile in breadth. The town is on the north-west side of the island. Wasein Harbour is in the channel between the island and the mainland which is about 1 mile wide. The shore of the mainland is fringed with mangrove, backed by low coral cliffs in which are some remarkable caves. (See 'Geology'.)

Northward of the eastern entrance to Wasein Harbour is Funzi Bay, bounded on the north-east by Funzi Island. The river Ramisi, lined with mangrove trees, enters the head of the western part of the bay. The eastern half is full of shoal waters through which there is a channel, used by dhows, to Funzi village situated on the west side of the island towards its southern end.

Ten miles farther up the coast, NNE., is Chale Point, to the west of which is Gazi Bay, with the Arab town of that name situated on its shore. Immediately south of the point is Chale Island, which with its tree tops, 60 ft. above sea-level, forms a prominent feature.

From Chale Point the coast trends NNE. in an almost straight line for 23 miles to Mombasa. It is generally low

and wooded, with sandy beaches, and is fringed with a barrier of coral reefs.

Mombasa Island, on the eastern side of which the town is situated, is 3 miles long in a NNW. and SSE. direction, by 2 miles wide. It is inserted in a deep arm of the sea, which runs up from the Indian Ocean far into the land, and is thus embraced by the mainland on three sides. The island, which is roughly oval in shape, is of coral formation with sandstone in places. It is luxuriantly wooded, and set upon low brown cliffs. The shore is steep all round, and there is deep water close in, except on the north and north-western sides.

The island of Mombasa possesses four harbours (q.v.) Kilindini to the south-west, Port Reitz to the north-west, Mombasa to the east, and Port Tudor to the north.

The port of Kilindini, in the channel on the south-west side of the island, is the principal harbour of British East Africa. It is singularly beautiful, and looks very unlike a great port, having the appearance of a narrow winding creek, wandering away into a wood. Palm trees come down to the water's edge.

The entrance, which has a least depth of 11 fathoms, is marked on the mainland to the south-west by the promontory of Ras Muaka Singe. Inside the general depth is 20 fathoms, with 35 fathoms in places. It is available for all classes of vessels, and capable of accommodating the largest liners.

Kilindini Harbour communicates with Port Reitz to the north-west, and Makupa Channel to the north-east. Port Reitz is a fine land-locked harbour, situated to the north-west of Mombasa Island, and extending due west for 3 miles.

Makupa Channel, which runs in a north-east and south-west direction, separates Mombasa Island from the mainland, and leads into Port Tudor. It is narrow and tortuous, and runs nearly dry at low water.

Mombasa Harbour is on the north-east side of the island facing the town, and is the chief port for local traffic and dhows. There is always a great press of small boats in the harbour. It communicates to the north with Port Tudor by

a narrow winding but deep channel, with steep wooded banks and most picturesque scenery. Port Tudor is shallow and is not used for shipping.

From Mombasa a thickly wooded country extends along the coast as far as Malindi. Twenty-seven miles NNE. of Mombasa is the estuary of the Senawe, a winding inlet of the sea between rocky bluffs. The little port of Takaungu is situated on the south bank just within the entrance. At low water the stream is confined to a narrow channel on the north side, and all the rest is uncovered. At or near high water dhows can get up to the town.

Three miles to the north of Takaungu is Kilifi Creek, a long winding inlet of the sea between high precipitous banks. One-and-a-half miles from the sea it widens out into a land-locked basin, shallow at its western end. The scenery is wild and beautiful, and on the north shore there is fine forest.

Sixteen miles NNE. of Kilifi Creek is the mouth of the Owyombo river, which is only fit for canoe navigation. From the Owyombo to Malindi, a distance of 11 miles, the coast continues thickly wooded and fronted by a coral reef. Malindi is a straggling town, built on a coral beach, on the south-west side of a shallow bight. A little to the south of the town on a small point is Vasco da Gama's Pillar built to commemorate his visit to Malindi in 1498. Malindi is well placed as the port of the most productive district on the coast, but the harbour is poor and shallow, steamers having to lie a considerable distance off the shore. A long stretch of sandy beach, backed by a range of sandhills about 50 ft. high, extends from Malindi to the Sabaki river. The Sabaki ranks with the Tana and the Juba as one of the three principal rivers of British East Africa, but its numerous shallows, sandbanks, and rapids render it valueless as a waterway.

North of the Sabaki the land rises to a coast range of red sandhills, in places 400 ft. in height. Three miles beyond the mouth of the Sabaki is the insignificant port of Mambrui, and 10 miles farther on is Ras Ngomeni, forming the extreme of a peninsula about 4 miles in length. West of this peninsula

is a series of shallow backwaters, with many creeks and inlets surrounded by mangrove swamps. Beyond Ras Ngomeni opens out Formosa Bay, 34 miles wide and receding 12 miles from the general line of the coast. Three rivers enter the bay, the Kalifi, the Tana, and the Ozi. The first named is a deep and rapid stream draining the swamps of Lake Krawa. North of the mouth of the Kalifi the coast consists of sandhills. The mouth of the Tana, the principal river of British East Africa, is difficult to distinguish. Under the influence of the north-eastern monsoons the sand has drifted down the coast, blocking the river mouths with large bars, and in the case of the Tana the accumulation of sand has completely silted up the original estuary, the river being compelled after it has reached 400 yards from the sea to flow parallel with it for 8 miles. The mouth of the Tana is now almost closed, its waters being diverted at Charra ($3\frac{1}{2}$ miles in a direct line from the coast) into the Belezoni Canal, and thence into the Ozi. The Tana has been navigated by a light steamer for over 300 miles from the sea. About 17 miles ENE. of the mouth of the Tana is the broad estuary of the Ozi, which opens from the sea across a shallow and dangerous bar. The little port of Kipini is on the eastern side of the entrance.

From Ras Shaka, the north-east point of Formosa Bay, to the mouth of the Juba, the coast-line is north-east and south-west. A stretch of shore some 20 miles in length separates Ras Shaka from the Lamu Archipelago. It is backed by a line of isolated sandhills, the highest of which is 237 ft. high, terminating in the hills of Dongo Kundu at the entrance to Lamu Bay.

The Lamu Archipelago consists of three large islands, Lamu, Manda, and Patta, and several others of small size. Like Mombasa Island, they are closely fitted into the mainland, and really form a continuation of the coast line. They are of coral formation, low and flat, sand dunes being the only heights. Lamu Island stands in a concave curve of the mainland shore. To the south of it is Lamu Bay, which lies between the promontory of Dongo Kundu, marked by conspicuous white

sandhills, on the mainland to the south-west, and the promontory of Ras Kitao on the island of Manda to the north-east.

Lamu Island is separated from the mainland by the channel of Mlango Kipungani, which curves round from Lamu Bay to the north-east. This channel is narrow, but deep enough for large boats even at low water. Long winding creeks run out of it into the land, of which the largest, known as Mlango Nkumumbi, extends north-westwards, from near the entrance into Lamu Bay, for 6 miles. The long narrow harbour of Lamu lies in the channel between Lamu Island and Manda Island to the east. The shore on either side is low and covered with dense scrub. The little town of Shella lies on a small promontory to the west of the entrance. Three miles above it is the town of Lamu, a network of narrow lanes and closely-packed houses, crowded round an old fort. The sandhills on the island are encroaching and covering up the towns. The sandhill, known as Hedabu, to the south of the present town of Lamu, marks the site of the old town which is now covered to the depth of 50 ft. The town of Shella is gradually being buried in the same way.

Manda Island to the east of Lamu is about the same in area. It is sparsely populated, and has grassy plains with low trees and thick bushes. The ruins upon it are of considerable extent, and testify to its former importance. Between Manda Island and the mainland to the north is the channel of Mlango Mkanda. It is narrow and tortuous, and at low water is a mass of mud. A wall of mangrove trees rises straight up from the water on either side, broken only by a few landing-places.

At the east end of this channel the mainland curves round to the north, making space for the island of Patta, which is situated to the north-east of Manda. Patta Island is the largest of the Lamu Archipelago, being 14 miles long by 4 to 6 wide. It is surrounded by mangroves, with a central plateau of raised coral. Between Manda and Patta Islands is Manda Bay, a fine sheltered anchorage with deep water in its approach, and available for all classes of vessels. Manda Bay communicates to the north-east with the broad Siyu

Channel, which divides Patta Island from the mainland, and has a least depth of 3 fathoms. Great creeks and swamps, lined with mangroves, run inland from it for many miles, the largest being Mongoni Creek, which opens out to the north of Manda Bay.

On the seaward side of Patta Island is Patta Bay, bordered with flats and shallow water. It lies behind a long promontory jutting out from the south-west end of the island, and separating it from Manda Bay. A coral reef fronts and protects it, and within it is the island of Kizingati.

The principal towns on Patta Island are Siyu and Faza, both situated on its northern side, towards the mainland. Faza is so girdled with mangrove swamps as to be practically a separate island when the tide is high. The Siyu Channel opens eastwards into Kwyhu Bay, between Patta and Kwyhu Islands. It is 3 miles wide at its entrance, but greatly obstructed by shoals. In its north-western part is Fazi Island with a small village, called Ndau, situated on a white sandy beach. Kwyhu Island is, as its name implies, the 'upper' or most northerly of the Lamu Archipelago. It is a hilly island of quite a different type to the others, composed of low sandy ridges, covered with scrub, and containing a conspicuous conical peak, 155 ft. high.

From Kwyhu north-east the coast is fringed with an almost continuous chain of low islets, for the most part connected with coral reefs, but having navigable passes here and there. They are very nearly five hundred in number and are known as the Bajun or Juba Islands. From Kiunga, 16 miles north of Kwyhu, where the mangrove ceases, except for a few patches, the coast continues open, consisting of low rocky coral headlands, such as Dicks Head (Ras Kiamboni), with wide and shallow sandy bays. Sixty-two miles north-east of the Lamu Archipelago is Port Durnford on the estuary of the Durnford or Birikau river, affording a sheltered anchorage for small vessels. The river banks are of coral with a fringe of mangrove, beyond which the country is covered with thick bush. A little to the north-east of the estuary of the

Birikau is Port Johnes, lying within the Ras Burgal peninsula which juts out from the shore and bends round to the north-east. Twelve miles farther on is Port Tula at the mouth of the Arnoleh or Anole Creek, which is navigable by dhows, and extends some 20 miles inland. Port Shamba, 10 miles north-east of the Arnoleh Creek, is formed by Tovai Island which lies nearly 3 miles from the mainland off the entrance to the Tovai or Shamba river. The river is deep within, but the bar is nearly dry at low water. Nine miles north-east of Port Shamba is Kwayama Island, the northernmost and largest of the Bajan group. It is much wider than most of them, and there is a village on its north-west side. The islets and reefs from here to Kismayu Bay are known as the Schmalcalder Chain. Kismayu Bay is contained between Blanket Point on the south-west and a point, off which is Kismayu Island, on the north-east. It is the northernmost harbour on the coast, and is a well-protected roadstead accessible at all seasons. Several isolated coral rocks in front of the bay form a natural breakwater. The only entrance to the harbour is difficult and tortuous, the channel winding in and out between the coral reefs. The coast within the bay is low and sandy, dotted with mimosa and scrub. The little town of Kismayu is a cluster of white houses and native huts at the northern end of the bay surrounded with sand dunes. It lies 9 miles south-west of the mouth of the Juba river. The former entrance of the Juba river is closed by a sandbank 20 ft. high, and a new mouth has been opened about 1 mile to the south-west. The river enters the sea over a dangerous bar, where the depth is only $1\frac{1}{2}$ ft. at low water. [See Waterways under 'Communications', p. 346.]

THE COAST PLAIN

The coast plain extends from the southern frontier to the neighbourhood of Lamu. It is tropical in character, and for the most part of extraordinary fertility. North of Lamu the bush-covered desert comes down to the coast, and there is little cultivation. The plain varies considerably in breadth.

Behind Mombasa it is not more than 2 or 3 miles wide, while on the Tana river it extends inland for about 20 miles.

It is broad at the southern end, in the Vanga district, where no range of hills or steep slope intervenes between it and the deserts of the interior into which it rises very gradually. The river Umba, which here marks the frontier, runs through a well-cultivated district for 9 miles from Gonja to its mouth, a continuous series of coco-nut plantations following its course. It is very deep after the rains but correspondingly low in the dry season. The river Ramisi, which rises on Mwele Hill and enters Funzi Bay, is never dry and always drinkable, though slightly brackish. It is narrow and easily fordable, except in the rains when it floods extensively. This portion of the coast plain is more cultivated than that farther northward, but is one of the few parts of the Protectorate that must be set down as dangerously unhealthy. The climate is very hot and damp, and there are large areas of swamp. Behind Vanga there is a wide stretch of flat land which is periodically flooded, and between Vanga and Shimoni and again behind Funzi Island the coast is swampy and lowlying. As a whole, the coast plain of British East Africa is remarkably free from swamp except at the southern end and in the district near the mouth of the Tana which is also most unhealthy. At the back of Shimoni, opposite the island of Wasein, there is a belt of dense forest containing excellent timber. The high elephant grass, the patches of impenetrable scrub, the swamps, and numerous small streams make this part of the coast plain very difficult travelling.

In the next stretch from Gazi to Mombasa, a distance of about 25 miles, the coast plain is narrowed between the sea and the foothills of the Shimba range. Behind Mombasa the plain is at its narrowest between the Makupa channel and the steep slope which leads up to Mazeras. At Takaungu it is interrupted by a line of remarkable red sandhills 400 ft. in height, sloping steeply to the sea. From here to the mouth of the Sabaki, behind Malindi, is a fertile district where much grain is produced. It also contains

the largest forest in the coast plain area, that of Arabuko or Shikoku (Sokoki). The forest begins on the northern shore of Kilifi Creek, and extends to the Sabaki, covering the north-eastern slopes of the Giriama Hills. From the Sabaki northwards the coast plain increases in breadth until, on the Tana, it is 20 miles broad. The low alluvial plains at the mouth of the Tana, and extending inland to Ngao, are very rich, the river flooding them twice a year. They represent the original estuary of the Tana. All that is now left of the great sheet of water that once covered this part are five lakes and innumerable swamps marking the sites of former lakes. They have been called the Tana 'broads' and closely resemble the Norfolk Broads, which were caused by the silting up of a great estuary once covering the site of Yarmouth. Some of these lakes are connected with the Tana, but others are completely cut off from it. The largest is Lake Ashakabobo, on the right bank of the river just below Ngao, which is 3 or 4 miles in length. Immediately to the south of this lake the Tana bends in an easterly direction. Two miles beyond the most easterly point reached in this bend is the river Ozi. The two rivers are connected by an artificial channel called the Belezoni Canal, 3 miles in length. It has been dredged and improved in recent years, and has a strong current from the Tana. The scenery on the Ozi is very beautiful, forests of fine trees stretching down to the water's edge. The Ozi has a short course of only 10 miles, but expands into a broad estuary. South of the Tana where it bends eastwards is an immense swamp known as Lake Krawa, drained by the river Kalifi. At the point where the Belezoni Canal enters the Ozi is the little town of Kau. Six miles due north of this is Witu, the capital of a small sultanate, situated in the middle of a flat well-cultivated valley. In the fertile region between Witu and Lamu is the forest of Utwani.

THE COASTAL HILLS

The passage from the coast plain to the higher country inland is in places well marked, the belt of plain ending at the

foot of a slope which looks like the side of a mountain range, but is really the eastern scarp of the great plateau beyond. North of Freretown, for instance, opposite Mombasa, there is a single slope of 800 ft., and the Uganda Railway climbs a similar hill-face to Mazeras. In other places there is a long and gradual ascent into the interior, while from the valley of the Ramisi, about 35 miles south-west of Mombasa, to as far north as the Sabaki, the coast plain is bounded by almost continuous ranges of hills which form an intermediate zone between it and the bush-covered desert of Taru.

Along the southern frontier, in the district of Vanga, a broad and richly watered tract of undulating country slopes upwards towards the inland plateau for many miles. Standing out from it are the three isolated volcanic heights of Jombo (1,573 ft.), Mrima (1,052 ft.), and Kiruko (622 ft.). The lower slopes of these hills are very fertile, and in the case of the two latter extensively cultivated by the Wadigo. Jombo is covered with dense forest, and rock exposures are scarce.

Across the undulating grass country which lies to the north of the river Ramisi, there rises the beautiful hill of Mwele (1,300 ft.), marking the southern termination of the Shimba hills. These extend northwards to the head of Port Reitz, with an elevation of from 800 to 1,400 ft. above sea-level. They consist of rolling downs with deep valleys and patches of forest. There is an extensive forest at Shimba, and another fine patch covers the summit of Mwele. Permanent streams abound, and the hills are extraordinarily fertile and well-watered. In places there is much boggy ground. Between the Shimba Hills and the coast there is a lower range of foothills from 400 to 600 ft. in height. The river Mamolo (also called Cha Shimba and Pemba) rises on Mwele and flows round the western side of the range into Port Reitz, where it forms a common estuary with the Mwachi. Beyond this river to the west there is a strip of open park-like country before the bush-covered desert begins. Between Mtai, the northern extremity of the Shimba Hills and Mazeras on the Uganda line, the

Mwachi comes down into Port Reitz through a strikingly beautiful valley, winding between lofty and heavily-forested cliffs. Both these rivers, the Mamolo and Mwachi, bring down a considerable volume of water and have powerful currents.

From Mazeras there is an ascent north by east to the plateau of Rabai. Five miles to the north of Rabai the Giriama hills begin, and extend northwards to the Sabaki. They consist of a series of parallel ridges covered with bush and forest, with only a few open grassy plains, and these mostly on the western side. The southern part of these hills, known as the Chonyi Range, is one of the most beautiful tracts of country along the coast. The principal heights of this range are Mount Jibana (1,087 ft.) and Mount Chonyi (1,152 ft.). Mount Mangea (1,776 ft.) stands alone at the northern end of the Giriama Hills. They are not nearly so fertile as the Shimba Hills, and the water-supply is poor. The only permanent water is at Vitengeni where there are always pools in the bed of the river. In the central part there are many salt springs and streams, and the ground is useless for cultivation. North Giriama would hardly be able to support any population were it not for the neighbourhood of the Sabaki river. On the south side of this river, at the foot of the Giriama Hills, which are here covered with forest, is Lake Jilore. In quite recent years this was a large sheet of water, but it is now entirely dry and covered with bush owing to the silting up of the channel by which the river water used to find its way into the lake-bed. On the opposite side of the Sabaki a river-bed begins and runs canal-like through the country for some miles until it joins the Sabaki again in the direction of the low richly-cultivated hill of Magarini. In the rains this river-bed fills and irrigates a large area. North of the Sabaki there are a few isolated hills, but for the most part a slope leads up from the coast plain to the plateau above, and there is no intermediate range of grass-covered heights. There is, however, to the north of Lamu, a single ridge of low hills, the Mundane range, rising out of the coast plain and running ESE. and WNW. for a considerable

distance, some 26 miles. This range is only 250 to 300 ft. above sea-level, and is thickly wooded. Behind it is the Dodori river which comes down from the north-east and flows into Dodori Creek behind Patta Island. It is a fine river and never dries up. Its sources have not yet been explored, but it is believed to issue from a huge forest extending to the borders of Jubaland.

THE NYIKA

The next zone is a broad, bush-covered, and almost waterless belt of nyika or desert. It varies in breadth from 200 to 120 miles, and slopes gradually upwards in a north-westerly-direction from 800 to 3,200 ft. above sea-level. As already stated it is continuous with deserts of Jubaland and the North Frontier Province, and thus extends through British East Africa from north to south. That part of it which lies to the south of the river Sabaki, and which is crossed by the Uganda Railway, is known as the Desert of Taru. On the line of the railway it begins at Maji-ya-Chumvi, though the thick bush country does not commence before Samburu, 10 miles farther on. Thence it continues as far as Makindu, a distance of about 170 miles along the line.

Though it appears to be a level plain relatively to the isolated hills, which here and there rise out of it, the nyika is really very uneven, and broken up by fissures and undulations concealed beneath the all-covering bush.

The soil is sandy, and red in colour. It is naturally of extraordinary fertility, but until it can be irrigated is quite useless.

The desert is broken by fertile belts along the course of the rivers which traverse it, especially the Tana, the Sabaki, and the Tsavo.

The Tana resembles the Nile on a comparatively small scale, as it rises in an area of great rainfall on the western side of Mount Kenya, and then after sweeping round the mountain to the south and east, enters a vast desert region where it fertilizes with its floods a strip of land on either bank. The

course of the river may be divided into three parts, upper, middle, and lower, corresponding to its passage through the Highland region, the nyika, and the coast plain.

The Tana enters the desert at the village of Hameye. From here to the sea, a distance of 320 miles, the river is navigable. Above this place it is a mountain stream with many cataracts and waterfalls. Though in its course through the nyika the Tana does not receive a single tributary, and must lose in volume by evaporation, it continues a broad stream with a powerful current. There are numerous winds, loops, and sharp bends, but its general direction is ESE., curving round to SSE., and finally almost due south. From Hameye onwards there are many small islands in the stream alternating with broad lake-like expanses. In the Korokoro district the river forks and forms a large island known as Galanaba Island or Oda Boru Ruva, which is very fertile and well cultivated. Besides this large island, there are other islands, also cultivated, in the main or southern branch of the river.

On each side of the Tana is a level plain of rich soil, bearing a narrow belt of dense luxuriant vegetation and a strip of forest, in places only a thin growth of trees and bushes of a drought-resisting character, but widening in other parts, as at Balarti near Hameye, to a breadth of 7 or 8 miles. There is a constant succession of villages on the right bank, close to the water's edge, in clearings of the forest. The left bank is almost uninhabited.

An immense waterless stretch of nyika separates the fertile belt of the Tana from that of the Sabaki. The intervening desert is crossed by the river-bed of the Tiva. Starting in the mountains about 15 miles north of Kitui, it follows a general southerly course with a growing eastward trend, winding between Yatta and the spurs of the Ukamba Hills, more or less parallel with the Athi. Then it bends away ENE. across the nyika to Lake Ashakabobo, the largest of the Tana broads. Except in its upper reaches it is dry for most of the year, only occasional pools remaining in the river-bed. It

never flows more than a few days at a time, though after the rain the rush of water is often very great. The Thua or Thowa river is similar in its characteristics to the Tiva, but is considerably larger. Rising like the Tiva to the north of Kitui it runs at first southwards, but soon turns east through the nyika. It disappears before reaching the Tana. The river Voi to the south of the Sabaki is also very similar. Rising in the Bura Hills in the Teita district, it intersects the Ndara Hills, but to the east of these its waters are soon lost in the thirsty soil. Its bed is continuous through the nyika to the north of the Giriama Hills. Here it turns south, and again becomes a river, receiving water from Mount Mangea to the north. In its passage through the Giriama Hills it is known locally as the Fuladoyo or Vitengeni, a considerable stream in the rains, but drying up in the hot season except for pools. It enters the northern corner of Kilifi Creek.

Between the Tiva to the north and the Voi to the south, is the Sabaki. In its upper course it is known as the Athi and flows south-east as far as its junction with the Tsavo. Here it becomes the Sabaki and traverses the nyika in an easterly direction to the sea. At first its current is swift and strong, and it flows over a rocky bottom with many rapids. About 14 miles from the point where it is joined by the Tsavo is Lugard's Fall. At Makongeni, about 40 miles from its mouth, and 10 miles north of Mount Mangea, the Sabaki is 60 yds. wide, with a sandy bed, while great walls of shady forest stretch along either bank. Though it never becomes quite dry, it is extremely shallow in the hottest and driest part of the year. It is subject to heavy floods, which are often very sudden in their rise.

The Tsavo rises on Kilimanjaro, and is the first permanent stream crossed by the Uganda line. It flows in an easterly direction, forming the northern boundary of the Teita district. The scenery along its course is very beautiful, and the country fertile and well wooded. The river is usually from 70 to 80 ft. wide. At intervals of a few miles prominent rocky ridges of gneiss traverse the country at right angles to the

stream. The river has cut a passage through them between steep walls of rock, and there are numerous rapids. On the north bank, about 20 miles west of Tsavo railway station, there is a mountain called Theuka, 6,000 ft. in height, the lower half of which is forested. Opposite to this, a few miles from the southern bank, there rises from the bush the gneiss dome of Manda or Vaita.

These are two of the many isolated hills which break the monotonous surface of the nyika. Most of them lie between the Uganda Railway and the southern frontier. Ten miles beyond Samburu to the west, and just to the south of the railway, are the twin hills of Taru, rising 300 ft. above the level of the plain, with permanent waterholes. Thirty-three miles farther on is the hill of Maungu (3,500 ft.). Twenty miles to the south of Maungu is the isolated height of Kisigau (5,370 ft.). It rises very precipitously from the plain, and is covered with dense bush, except for a few open grass glades and exposures of bare rock. There are streams on the hill, but they disappear in the plain.

East of Kisigau are two other similar hills, Rukinga and Pika Pika, and 12 miles south-east of the latter is Kilibasi (2,752 ft.), the bush on which is dense and impassable. These heights lie on a line approximately parallel to and about 26 miles from the frontier.

Round Voi are the hills of the Teita district. These are not isolated heights like Kisigau, but ranges, striking north and south, and might be described as a detached portion of the highlands. To the south of Voi are the Ndara Hills which have an altitude of 4,380 ft. The station of Sagalla, 10 miles from Voi, is situated high up on their western slopes. North-west of Voi are the Ndi Hills which are forested on their summits, and 12 miles to the west are the Bura or Dabida Hills. These latter are bold and precipitous with sharp outlines, and reach an elevation of over 7,000 ft. There is abundance of permanent water on all these hills, the sources of streams which dry up in the thirsty nyika below. The hills themselves and the intervening valleys are well

cultivated by the natives of the Wadabida tribe. The southern hills of the Bura range have a greater rainfall than those farther to the north, and the grass upon their slopes and summits is perennially green. The Mwatate valley, which opens southwards to the nyika, is very fertile in its lower parts, and there are large plantations. Farther to the west the Bura valley climbs northwards in a series of steps with great peaks ranged round its head. There are a number of villages in the higher parts. A line of fine forest trees follows the dry river-bed of the Bura 16 miles out into the desert. Along the course of the Voi river between the Bura and Ndara Hills there is a belt of rich alluvial land.

West of the Bura Hills is a waterless stretch of the nyika known as the Serengeti plains, which extend to Lake Jipe and the river Lumi. Between the Bura Hills and the outlying hill of Maktau the plain is covered with dense bush. Thence to Mbuyuni, a distance of 13 miles, the plains consist of low ridges running north and south with bush-clad tops, and the shallow intervening depressions more open. Mbuyuni is situated on a low ridge of this character, to the east of which is a depression a mile wide of practically open pasture with hardly a tree. Four miles farther west is Serengeti, on a similar ridge. Beyond this, 2 miles to the west, is the isolated hill of Saleita, a rounded mass of rocks, open at the top, rising 130 ft. above the plain, with dense bush to north and south. From Saleita there is a gradual descent of 6 miles to the river Lumi, the banks of which are very swampy. This river, which represents the upper course of the Ruwu, rises on Kilimanjaro, and curves round to the south, skirting the eastern slopes of the mountain and bounding the Serengeti plains to the west. There is fine tropical forest on the middle course of the Lumi. The forest proper, near Taveta, is $1\frac{1}{2}$ miles long by 1 mile broad. Above this it is a mere strip, and below it degenerates into bush. The Lumi enters the north-western corner of Lake Jipe, a short distance to the east of the point where the Ruwu issues from it.

Lake Jipe lies at the foot of the North Pare mountains.

It is 8 miles long by 2 broad, infested with crocodiles, and surrounded by a wide belt of papyrus swamp. The isolated heights of Vilima Viwili and Monyoni stand on its eastern shore.

Taveta, on the right bank of the Lumi, about 16 miles N. of Lake Jipe, is a low unhealthy spot, with hills all round it, except towards the river. Five miles to the west of Taveta are the Kitowo Hills, a semicircle of heights projecting south-eastwards from the southern slopes of Kilimanjaro. They rise about 1,000 ft. above the plain, and are very steep and covered with dense bush. Between the two summits of Latema and Reata, the former of which is on the frontier, there is a low pass, the Latema-Reatanek, forming a narrow gateway into Tanganyika Territory, between the foothills of Kilimanjaro to the north and the vast swamps of the Ruwu to the south.

Six miles north of Taveta, on a spur of Kilimanjaro, is Lake Chala, the most beautiful of the numerous crater lakes of East Africa.

North-east of Lake Chala is the Ziواني Swamp, out of which flows a tributary of the Tsavo. The lower slopes of Kilimanjaro on the east and north, below the forest belt, are open grass. They are strewn with rough blocks of lava and here and there are small conical hills. Towards the plain of the Tsavo river are impenetrable thickets of dense thorn jungle. To the north of the mountain is the Nyiri or 'Swamp' Desert, lying at an elevation of 3,300 ft. The southern part of this, immediately below the slopes of Kilimanjaro, is a vast area of swamps and shallow sheets of water, such as Lake Amboseli and the East and West Nyiri. They extend westward along the frontier in the direction of Ol Donyo Erok, and eastward to the Ongalea and Kyulu ranges, forming an intricate system of rivers and lakes. It is an independent system and does not communicate with the Tsavo, at any rate above ground. The water here is all saline, but becomes drinkable in the rains. The area of these swamps varies very much according to the season. In the dry weather large parts

of this region are almost waterless, and entail long marches from water to water, but in the rains it becomes one immense swamp.

To the east of the Nyiri Desert and north of the Tsavo river a strip of the nyika, forming a plain about 25 miles across, runs up in a north-westerly direction. It is bounded on the north-east by the river Athi, across which rises the long line of the Yatta plateau, and on the south-west by the Kyulu range which separates it from the swampy country to the north of Kilimanjaro. Dense thorn bush covers this plain as far as the station of Masongoleni on the Uganda Railway. A little to the north of this is Kibwezi, where the vegetation is luxuriant and there are many big trees. It is, however, one of the most unhealthy places in British East Africa. The river Kibwezi is a permanent stream which emerges from underground beneath an overlying mass of lava, and runs NNE. into the Athi. It is not improbable that it has its source in the forest of Kilimanjaro, and disappears, like other streams from the mountain, underneath the lava.

In the 60 miles which separate Kibwezi from the Tsavo there is a rise in the levels from 1,600 to 3,000 ft. This greatly increased gradient marks the approach to the highlands, and the long and comparatively narrow plain between the Yatta plateau and the Kyulu range is like a passage leading up to them. Looking south-west from Kibwezi the snow-capped summit of Kilimanjaro stands out above the intervening Kyulu range. Three miles to the north of it is the rugged wooded height of Bwinzau.

The nyika continues past the fertile area round Kibwezi, as far as the neighbourhood of Makindu, 10 miles farther to the north-west. Here open park-like country begins, which is traversed by the Kiboko and Salt rivers, large but not permanent streams. From Makindu to Kiu the average gradient is 30 ft. in the mile, and from Kiu to Ulu this increases to 100 ft. Kiu station marks the eastern limit of the highlands on the Uganda line.

THE EASTERN HIGHLANDS

The highland region consists of four parallel zones running north and south, approximately parallel with the coast. The first of these is a succession of intermittent mountain ranges which form the eastern boundary. The second is the series of lofty plateaux which lie between the mountains and the Rift Valley. The third is the Rift Valley itself. The fourth is a second series of plateaux to the west of the Rift Valley, with which may be included that part of the littoral of the Victoria Nyanza which lies within the limits of the Protectorate. These plateaux are composed for the most part of sheets of lava, and support the great volcanic mountains of Kenya and Elgon, and the Aberdare Range.

The intermittent mountain ranges which form the first or eastern belt of the highlands are mainly composed of gneiss and generally strike from NNW. to SSE. In altitude they vary from 5,000 to 7,000 ft., and even more, rising about 2,000 to 3,000 ft. above the normal level of the country. They are described by Gregory as being part of the primitive axis of the continent, at one time continuous from the Drakensberg in Natal to the Shoho Mountains in Abyssinia. The Usambara and Pare Mountains belong to this series, as do also the numerous isolated hills which break the level of the desert of Taru, and the hills of the Teita district. The Kyulu range appears to be partly volcanic, but the line of gneiss hills is continued northwards by the hill of Bwinzau to the north of Kibwezi, and a number of other isolated heights, usually bare and hog-backed in shape, in the neighbourhood of Simba and Sultan Hamud. North of these are the mountains of the Ukamba Province, which fall into two groups, those of the Machakos district to the west, and those of the Kitui district to the east, and are fairly thickly populated by the Akamba tribe. The type of country is one that is characteristic of a well-marked zone of the eastern portion of the African continent between latitude 1° north and about 8° south. Between the ranges great areas of flat

country occur, sometimes park-like, but more often covered with thick thorn bush, traversed by great watercourses which generally have water in them only in the rains, though at all seasons it can usually be obtained by digging holes in the clean white sand. Numerous springs are found on the hills and around their bases.

The hills of the Machakos district occupy a well-defined area between the line of the Uganda railway from Sultan Hamud to Ulu on the south and the prominent isolated height of Ol Donyo Sabuk on the north. Round this height the Athi makes its great bend from north-east to south-east and thus encircles these hills on three sides. They may be described as consisting of a series of concentric ridges, surrounding a plateau or central area of elevation, on which the post of Machakos is situated at an altitude of 5,400 ft. The hills are usually bare and grassy, diversified with outcrops of rock, and intersected by numerous well-watered valleys, the whole district being the most fertile and best watered portion of the Akamba country. There is no general name covering all these hills. To the south of Machakos they are known as the Ulu Hills or Iveti Mountains. To the north-west of Machakos are the Mua Hills, where considerable colonization is going on, as it is a fine centre for the citrus industry. These hills are not very open. In places they are covered with bush and intersected with deep ravines. West of the Mua Hills are the Lukenia Hills which slope down to the Athi and are remarkable for their caves. To the south-east the bold peak of Nzaoi is a prominent landmark. It is a gneiss fault scarp, 6,100 ft. in height, and descends abruptly in a precipice of 1,000 ft. The rectangular features of the lava plateau of Yatta, which rises in a steep escarpment immediately behind the Athi to the east, form a striking contrast to the irregularly curved outline of the gneissic hills to the west.

Northwards from Ol Donyo Sabuk across the Athi is the Ithanga range, enclosed in a great elbow bend of the river Thika where it turns north to join the Tana. The hills at the southern extremity of this range are very fantastic in

their appearance with huge poised blocks upon their summits. Isolated hills, though nothing that could be called a range, run north-west to a little beyond Fort Hall, where the slope of Mount Kenya begins. These hills rise from a grassy plain with patches of bush.

Some 60 miles to the east of Machakos, across the Athi and the plateau of Yatta, is the important post of Kitui situated at an elevation of 3,750 ft. There is a populous strip of country, some 160 miles in length by 50 broad, running north and south of Kitui, between the Athi and the Tana, along which lie successive ranges of hills. They are bolder in outline and more rugged than those round Machakos, forming peaks, pyramids, domes, and castellated rocks. Outside this strip the country is mostly uninhabited, the soil unfertile, and the rainfall insufficient. Except in the Athi and the Tana there is no permanent water. The many large river-beds are quite dry and covered with bush; that of the Nziu, for instance, has not had any water running in it for many years. West of Kitui there is a steep drop of about 2,000 ft. into the desert, while along the Tana to the north the country falls westwards in successive terraces.

The hills of the Kitui district terminate in the Mumoni range, round the northern end of which the Tana makes a bend to the east. The fine castellated rock of Ngomeni is situated eastwards of the Mumoni range, and marks the limit of the hill-country in this direction towards the nyika.

On the other side of the Tana, to the north, the line of gneiss hills is interrupted by the volcanic range of the Jombeni (Nyambeni) Mountains, the lava flows from which extend southward to the Tana and northward to the Guaso Nyiro. In the region between the northern slopes of Mount Kenya and the Guaso Nyiro are several isolated gneiss hills, some of which have been weathered into the most fantastic shapes. To the north-west of Kenya, on the edge of the Laikipia plateau, is the ridge of Loldaika. Thus the gneiss hills and ranges which disappeared beneath the enormous pile of

Kenya in the neighbourhood of Fort Hall, reappears on the northern side of the mountain.

North of the Guaso Nyiro there is a line of isolated heights rising very precipitously from a bare plain. Mount Lololokwi is 7,750 ft. and Mount Uaraguess to the north-west 8,700 ft. in height. These extend northwards to General Mathew's Range, the north-western end of which is known as Ndoto.

Though this line of mountains and ridges, from the German frontier to Ndoto, constitutes the main western limit of the nyika, there are places where the desert penetrates right through this belt of country to the lava plains beyond. This is especially marked on the Uganda line, where the nyika continues beyond the fertile oasis of Kibwezi and the isolated gneiss hill of Bwinzau. From the other side these hills have been penetrated by intrusions from the lava plains, of which the most remarkable instance is the long, low lava-capped plateau of Yatta, known in its southern part as Ndungu. It runs parallel with the left bank of the Athi in a south-easterly direction to some miles beyond its junction with the Tsavo, separating the gneiss hills of the Machakos from those of the Kitui district and falling down in a steep escarpment on either side. The plateau is only 3 or 4 miles across, while its length is 176 miles (see 'Geology').

The river Tana, which in the Akamba country bears the name of Kiloluma, makes a great bend through this region in an opposite direction to that of the Athi. Rising in Mount Kenya it flows south-east past Kikuyu, to the east of Fort Hall, and then north of the Ithanga range. After this it begins to bend round to the north-east, enclosing between it and Mount Kenya, the district of Embu, which it divides from that of Kitui. The station of Embu is situated on the edge of a great plain, which to the south and south-east slopes gently to the Tana. To the east the plain is bounded by the Embere Hills. Immediately behind Embu the slope of Kenia begins. From Embu northwards to Meru along the eastern slopes of Kenya and up to the Jombeni range, the country is fertile, cultivated, and very populous, though in places there

are great areas of dense bush. The southern and eastern slopes of Kenya are intersected with deep ravines, often extremely beautiful and filled with trees. The country is traversed by numerous streams, which radiate from Mount Kenya like the sticks of a fan, and come down to the Tana through deep gorges. Of these the principal is the Thiba, which flows through a precipitous and narrow defile. There is a fine fall on this river, 100 ft. in height, due south of Kenya. The Thiba is joined by two other rivers, the Inyamindi and the Ribongazi. The former is spanned by a great natural bridge which is crossed by the road from Fort Hall to Embu : the gorge of the latter lies below the hill on which Embu is situated.

Just where the Tana begins to make its bend to the north-east it receives from the south its principal tributary the Thika. This river rises in the Kikuyu uplands, and after traversing the Kikuyu plateau in a general south-easterly direction as far as Chania bridge, turns east, forming the northern boundary of the Athi plains. Round the Ithanga range it makes a big elbow bend from south-east to north and comes down to the Tana through fine gorges and over a series of cascades. The Tana, at the point where it is joined by the Thika, is from 150 to 300 yds. wide, and when in flood 30 to 40 ft. deep, but in the dry season it is usually fordable at the old caravan crossing near the mouth of the Thika. From here the Tana flows at first ENE., and soon becomes enclosed with a thick screen of bush, so that it is almost impossible to reach the water. A little beyond its junction with the Thiba it descends over a magnificent waterfall, and ten miles farther on there is another fall which is even finer. Below this it splits into a maze of channels known as the Seven Forks, but the main branch is easily distinguishable by its greater depth. After this it turns almost due north. On reaching the Mumoni Hills it flows in an exceedingly straight rocky channel, which in some places is only 25 ft. wide, between steep, bush-covered banks. Up to this point the river has been one long succession of cascades, but now short placid reaches begin, studded with

islands. To the north of these hills are the Grand Falls, where the river turns in an easterly direction, descending to the nyika over a succession of terraces with intervening plains. The rapids on the river become fewer and smaller. About 40 miles ENE. of the Grand Falls the Tana receives its last tributary, the Mackenzie river. The final fall on the Tana, and the last series of rapids occur 10 miles above Hameye, from which point the river is navigable.

THE CENTRAL HIGHLAND PLATEAU EAST OF THE RIFT VALLEY

Between the line of intermittent mountain ranges just described, and the Rift Valley to the west, is a series of lava-covered plains, extending northwards from the southern frontier.

On the south are the vast plains of the Matumbatu Masai, bounded on the west by the Rift Valley, and sloping down eastwards into the Nyiri desert. Along the frontier the plains are broken by hills and mountains. Of these the most important is Mount Erok or Ol Donyo Erok, 7,221 ft. in height, and situated on the frontier line. It is partly wooded and partly covered with pasture. Round its base is a district watered by perennial streams descending from it. The river Namanga rises on Mount Erok, and flowing to the south-east is lost in the great swamps to the north-west of Kilimanjaro. North of Mount Erok, across a stretch of open undulating country, are the Ol Emperasha Mountains, which strike WNW. and ESE. They lie on the edge of the Nyiri desert, and the road from Kajiado, on the Magadi railway, to Mount Erok crosses them by the Ol Ekunoni Pass. On the north-eastern slopes there is a plentiful supply of water. Except, however, on these mountains, and round Mount Erok, the Masai plains, though covered with good grass, are not well watered. In places there is a considerable amount of bush.

These plains are continued to the north by the Kapiti and Athi Plains, which border each side of the Athi and Stony Athi, and run eastwards along the Thika, which may be taken

as their northern boundary. On the east they extend to the foot of the Machakos Hills. Kapiti or Kaputei is the name given to the southern part of these plains where they are crossed by the Magadi railway. There is, however, no difference in character and scenery between these and the Athi Plains to the north. They consist of broad stretches of undulating country, entirely treeless, except along the course of the streams, which usually run in gorges filled with trees and vegetation. In altitude they vary from about 4,000 to 5,500 ft. above sea-level. On the west they slope up to a succession of short hill ranges, with broad intervals between them, beyond which is a narrow mimosa-covered plain, running north and south, along the eastern edge of the Rift Valley. These hills extend northward to the five-peaked hill of Ngong or Lamwea, a striking object in the view south-west from Nairobi. Between the peaks there are exceedingly narrow cols, and to the west the hill falls sheer down into the Rift Valley. The river Athi rises in this hill and flows westwards to a little beyond the Uganda line, where it is joined by the Stony Athi coming down from the south. After this it continues through the plains in a shallow valley in a north-easterly direction, until it bends round Ol Donyo Sabuk. Here it is divided from the Thika by a hardly perceptible ridge, remarkably low and narrow, the two rivers running parallel for a considerable distance, with an interval of only 3 or 4 miles between them. At this point there is a series of very fine waterfalls on the Athi.

The Athi Plains end at the foot of the Kikuyu plateau, which rises out of them in a long gradual slope continuing north-west to the edge of the Rift Valley. The horizon in this direction, as seen from the plains, is an undulating line with here and there more or less prominent outstandings. The change in vegetation at the foot of this slope is very marked and abrupt, the open treeless grass giving place to bush and strips of forest.

To the south and east the limit of the Kikuyu plateau might be roughly indicated by a line drawn from Ngong

through Nairobi to Fort Hall. To the west is the Kikuyu escarpment of the Rift Valley and the southern part of the Aberdare Range. The long serrated height of Kinangop or Nyanderua in this range, 12,920 ft. in height, is a most conspicuous feature looking north-west from the Nairobi-Fort Hall road. The whole country falls down towards the south-east from the mountain and its foothills. The northern boundary of the plateau is marked by Nyeri Hill, and a line of other isolated hills or low kopjes extending across the gap between the Aberdares and Mount Kenya.

The length of the Kikuyu Plateau is about 100 miles, while its breadth varies from 30 to 50 miles. At the point where the Uganda line begins its descent into the Rift Valley, the altitude is 7,830 ft., while Nairobi, on the verge of the Athi Plains, has an altitude of 5,450 ft. The chief characteristics of the Kikuyu plateau are its deep and sinuous valleys and its innumerable watercourses. There is not a level piece of ground in the whole country which consists of a continual sequence of ridge and valley. A few of these ridges are fairly broad, but most of them are very narrow. A fringe of primeval forest borders the plateau to the south and west. The western forest-fringe is at first separated from the Rift Valley by an undulating bush-covered plain some 5 miles in breadth. Farther to the north this strip of plain disappears, and the forest runs along the edge of the escarpment and finally connects with the great forests of the Aberdare Range. The soil is very rich and the country is thick with cultivation. Kikuyu is the most populous part of the Protectorate. North and north-west of Fort Hall there is a continuous line of villages, as far as Nyeri in one direction and as far as Kororis (Kauroris) on the slopes of Kinangop in the other. This latter place is beautifully situated on an expanse of lawn-like grass in a clearing of the Aberdare forest. To the north-east of Fort Hall under Kenya is another area of dense population. To the south the plain stretches away, without habitation, to the height of Ol Donyo Sabuk.

The numerous streams of the Kikuyu plateau, represented

on the map by a constant succession of lines, run south-east from the Aberdare range and the summit of the Kikuyu escarpment, and by the time the plain is reached have attained a fair size. The most important from south to north are the Nairobi, the Chania, the Thika, the Maragua, and the Mathioya. Nairobi is situated on the first of these and Fort Hall on the last. Waterfalls are numerous. Near the junction of the Chania and the Thika there are fine falls on both rivers. The streams north of this junction are tributaries of the Tana, those to the south, including the Nairobi, are tributaries of the Athi.

The plateau of Kikuyu is succeeded to the north by the Nyeri Plains, a district also known as West Kenya. The Nyeri Plains resemble the Kikuyu Plateau in being intersected by numerous deep and steep-sided valleys, containing perennial streams, and usually forested; but the constant succession of ridge and valley, characteristic of Kikuyu, ceases, and the valleys are separated by intervening grassy plains, from 2 to 5 miles in breadth, and sloping gently towards the east. This type of country continues across the Guaso Nyiro as far as the river Ngorongobit. The altitude of the Nyeri Plains is about 7,000 ft. In places there is a considerable amount of prickly mimosa. Where the plains approach the Aberdares on the west, or Kenya on the east, they run up in long grassy glades into the forest.

Mount Kenya, the native name for which is Kirenyaga, rises on the eastern side of the Nyeri plains. It is an enormous extinct volcano 17,040 ft. in height. The line of the equator passes across its northern slopes. Its immense mass is crowned with three peaks, of which the central is the highest, and presents from certain aspects the appearance of a double peak. The mountain may be divided into three zones—the first covered with forest where the gradient is very long and gentle, the second a zone of open Alpine pasturages where the slope becomes much steeper and is cut up by deep valleys into a complex series of ridges, and the third forming the central core, extremely rugged and difficult, and pre-

senting on all sides a formidable array of bare precipices. The glaciers of the mountain, thirteen in number, are all on the south-west side of the central peak, and do not descend below 14,500 ft., though there are moraines extending to more than 5,000 ft. lower. Owing to the precipitous character of this peak, there is nothing on Kenya to be compared to the snowfields which cover the broad dome-shaped summit of Kilimanjaro ; but Kenya is the grander of the two in appearance, and if not the highest, is certainly the largest mountain in Africa. The left bank of the Tana may be taken to mark the limit of the slopes of Kenya, except for an almost level stretch of plain between that river and Embu. The slope is shortest on the western side owing to the great altitude of the Nyeri Plains, so that the mountain gives the impression of being buttressed up against them. Immense forests encircle Mount Kenya, 120 miles in circumference, with an average breadth of from 8 to 9 miles. On the north-west, however, there is a gap of about 6 miles where the open moorland of the higher zone extends right down the mountain. The forest is thickest on the south-west, where it attains a breadth of 16 miles. It is very thick also in the south-east, and here in the lower Embu country it begins at an altitude of a little under 6,000 ft. On the western side it begins on the level of the lofty Nyeri Plains at about the 7,000 ft. line. Except to the north the slopes below the forest provide the best agricultural land in the Protectorate and are well cultivated, though on the western side the white settlers of the Nyeri Plains are mainly sheep and cattle farmers.

Mount Kenyá is the source of the Tana, the principal river of British East Africa. It is derived from eleven out of the thirteen glaciers on the mountain. The feeder streams which leave these glaciers rapidly increase in volume as they traverse the very wet valleys lying between the ice-clad region above and the upper limit of Kenya's forest-girdle below. After descending to an altitude of 12,000 ft. the streams enter the broad girdle of forest. Emerging from these dense forests in a south west direction, they bend to the south-east, and

traverse the cultivated Kikuyu country. Here the enormous fan of streams pouring off the mountain collects as a strong river, which in Kikuyu is called by the natives Thegana, and lower down in Ukamba, the Kiloluma.

Further contributions reach the Tana from the Aberdare Range, a long stretch of mountainous country, lying some 50 miles to the west of Mount Kenya, piled up on the western edge of the Nyeri Plains and the northern part of the Kikuyu Plateau. This range runs approximately north and south for 90 miles. The slopes are covered with forests which formerly united with those of Kenya, but are now separated by 50 miles of open plain. To the north of Mount Kinangop (Nyanderua) the range spreads out into a broad back of boggy, heather-clad moorland with numerous streams. In scenery it resembles a Scotch moor, and is known to the natives as Nguzeru. The belts of bamboo and forest lie below it on the slopes. Towards the northern end of the range is the summit of Satima (13,400 ft.) beyond which the Aberdares tail away in a long, down-like ridge sloping into the Laikipia plateau. To the west of this ridge, and between it and the Rift Valley, is the Angata Pus or Blue Plain in which is the great swamp-lake of Olbolossat. The overflow from this lake does not drain into the Rift Valley, but north-east into the river-system of the Guaso Narok, between the northern end of the Aberdares and the height of Marmanet.

North of the Nyeri Plains is the great Laikipia Plateau. At first there is no change in the scenery. The southern part of the plateau is well watered, and the Guaso Nyiro flows through it. But farther north there is a marked alteration in the topography. The country becomes flatter and drier, the valleys shallower, and the streams smaller. This is due to the fact that the influence of the forest-covered Aberdare Range in precipitating rain and producing perennial streams is now lost. The Laikipia Plateau consists of undulating downs of short grass, mostly bare and open, but with occasional patches of forest, and here and there isolated rounded hills or kopjes, rising about 300 ft. above the plain. It is roughly

oval in shape, and is bounded to the north by the Loroghi Mountains. The general elevation is from 6,000 to 7,000 ft., sloping upwards to the east where it reaches an altitude of about 8,000 ft. on the edge of the Rift Valley.

The Guaso Nyiro rises on Mount Satima, and flowing at first north-east may be regarded as forming the southern limits of the Laikipia Plateau. It then runs almost due north for about 60 miles, cutting its course deeply through the volcanic rock. Many streams from the Aberdares and Mount Kenya discharge their water into it. Of these tributaries the principal is the Guaso Narok or Black River, which flows north-east from the northern end of the Aberdares. The overflow from Lake Olbolossat drains into this river. In its upper reaches occur the falls known as Thomson's Falls, where the river descends 200 ft. into a densely-wooded valley. The government station of Rumuruti is situated on this river at the southern end of the Pes swamp, which is an expansion of the Guaso Narok, and extends for about 14 miles, its entire surface covered with papyrus grass. Papyrus swamps are a noticeable feature of this region, and are found on other streams flowing from the Aberdares. The country round Rumuruti is rolling plain covered with grass interspersed with bush and forest glades. From the northern end of the Pes swamp to its junction with the Guaso Nyiro, a frowning lava escarpment follows the left bank of the Guaso Narok. Where the two rivers meet, there is a good deal of thick bush.

Going north from Nyeri, the Amboni river from the Aberdares, and the Rongai from Mount Kenya, are the last streams belonging to the Tana. After that all the streams are tributaries of the Guaso Nyiro. The Nanyuke, which joins the Guaso Nyiro 15 miles south of its confluence with the Guaso Narok, is a considerable stream flowing north-west from Mount Kenya. On its right bank is the hog-backed ridge of Loldaika, which stands out conspicuously from the plain to the north-west of Kenya and marks the eastern limit of the Laikipia Plateau.

North of Rumuruti, the Laikipia Plateau is not nearly so

well watered, and the rainfall is deficient. The grazing, however, continues good, and the plain extends in gentle undulations to the Loroghi (Lorogai) Mountains. In places there are small springs welling up to the surface, and forming little swamps, surrounded by rushes and black saltish earth, but no stream leaves them.

About 30 miles north of its junction with the Guaso Narok, the Guaso Nyiro begins its great bend to the north of Kenya. Turning sharply to the east the river bears round in a great sweep to the south-east, finally striking off in an ENE. direction.

Between the river and the northern slopes of Kenya is a barren bush-covered plain, with some isolated hills. The slopes of Mount Kenya are grass covered and fairly well watered, though to nothing like the same extent as on the other sides of the mountain. The principal rivers are the Ngare Ndare and the Isiola. West of the former river, a lofty ridge projects northwards from Kenya, 10,000 ft. high, close to the mountain, which is known to the natives as El Daiga or the Pig Tail.

Meru, the head-quarters of a populous and thriving district, is beautifully situated on the north-eastern slopes of Mount Kenya. It stands at an elevation of 5,300 ft., and commands a wide view over mountains and desert. The river Kathita, which flows past the station, is a tributary of the Tana. North and west of Meru there is no population to speak of; the main population is to the east.

The Jombeni (Nyambeni) Mountains lie to the north-east of Kenya. They are a volcanic range, striking north-east and south-west, very finely wooded, and with a greatest altitude of over 7,000 ft. There are two crater lakes on the summit of the range. The view to the east extends for miles over level country. The southern slopes are well watered by streams which are tributaries of the Tana, and the country is fertile. The northern slopes, on the other hand, are practically waterless, except at the south-western end, near Dominku's village, where two streams rise, which flow into the

Guaso Nyiro. Out on the plains to the north-east of the range is the remarkable sunk crater of Mgombe or Chiombe, a huge hole in the ground, some 700 ft. in depth. Between the Jombeni Range and the Guaso Nyiro the ground falls down in a succession of terraces to the river. It is strewn with lava, and quite waterless.

Mention has already been made of the fantastic gneiss hills in the region between Mount Kenya and the Guaso Nyiro. Great cliffs, sometimes of red gneiss, sometimes of black lava, overhang the river in places, forming gorges often with absolutely perpendicular sides. Such a gorge occurs about 20 miles down stream from Archer's Post, between the great mass of Mount Shaba on the southern bank, and another height called Laishamunye, which rises 2,000 ft. above the plain on the northern bank. This latter is 12 miles in area, very desolate and inhospitable in appearance, with boulders flung about in all directions, and tipped on its southern crest with pinnacles of rock. At this point the river is reduced to a narrow ribbon by great black walls of lava which rise 60 ft. above it on either side. Immediately to the west of this is one of the largest of those extraordinary lava formations which occur on the southern bank of the Guaso Nyiro in this district, great piles of insecurely poised blocks of jagged lava, resembling slag heaps in appearance. They form strips and plateaux, sometimes of considerable area, and are very difficult to cross.

There are numerous rapids on the river, which finally terminate at Chanler's Falls, about 20 miles north-east of Laishamunye, where the Guaso Nyiro descends 70 ft. At low water the sill of the fall is quite dry, with narrow water-worn channels close to either bank. Below the falls the river passes through a deep gorge, and emerges into a broad alluvial plain, which stretches eastwards to the Lorian Swamp. (See below, Jubaland and the North Frontier Province.)

East of the Jombeni Range, and about midway between the Guaso Nyiro and the Tana, is a large watercourse known as the Ganale Gof, which contains permanent water. It begins at a place called Garrba Tula, where a station has

recently been opened, and flows ENE. in a direction roughly parallel to that of the Guaso Nyiro. It comes to an end about 12 miles south of the Lorian Swamp, the southern bank of which is in the Meru District of the Kenya Province.

On the northern bank of the Guaso Nyiro, 46 miles due north of Meru, and connected with it by a good road, is Archer's Post. It is situated on a small hill, 200 ft. above the river, over which there is a ford. From here to within 25 miles of the Lorian Swamp the banks of the river are fringed with a belt of magnificent dom palms. In the vicinity of Archer's Post the undergrowth is very thick, and it is impossible to travel by the side of the river. Outside this belt, on the northern bank, the nyika stretches to the horizon, covered with stunted leafless trees and thin scrub.

Westwards the nyika continues past the isolated heights of Varaguess and Lolokwi, which rise precipitously from it as far as the Laikipia Plateau and the Loroghi Mountains. These latter, as stated above, constitute the northern limit of the plateau. There is good grazing upon them but little or no water. North of this there is a pronounced change in the level of the country. On the one side of the Loroghi Mountains is the lofty Laikipia Plateau, and on the other, 2,000 ft. below it, an arid thorn desert extends to General Mathew's Range. This range strikes north-west and south-east. The Samburu call its south-eastern end Lengeyo and its north-western Ndoto. There is a stretch of good grazing ground on the Embarta steppes, which lie to the west of Ndoto.

While the highland plateau thus declines into the desert, the line of mountains is continued northwards. There is an almost continuous chain from Mount Kenya through General Mathew's Range, Nyiro, and Ol Donyo Mara, to the southern shore of Lake Rudolf, and so on up the eastern side of the lake by Mount Kulal, Esie, and the Huri Hills to the confines of southern Abyssinia.

THE RIFT VALLEY

The general character of the Rift Valley has already been described. (See 'General Description'.) It will be sufficient to state here that it is part of the great highland plateau, and represents what was formerly its highest ridge, which has subsided between 2,000 and 3,000 ft.

Mountain walls or escarpments rise on each side of it in roughly parallel lines from north to south. Between these the floor of the valley, which varies in breadth from 20 to 50 miles, is studded with extinct volcanoes and divided into basins by transverse ridges. A succession of lakes occupies these basins. They have no communication with one another above ground, though there is almost certainly an underground connexion. With the exception of Lake Naivasha, which is fresh, their waters are strongly impregnated with chemicals, and undrinkable. The general direction of the valley is first north to Lake Naivasha, then north-west to Lake Nakuru, and beyond that almost due north again.

The beautiful section of the valley is the middle part, which contains Lakes Naivasha, Elmenteita, and Nakuru.

The frontier passes across the valley along the northern shore of Lake Natron, the altitude of which is 2,000 ft. above sea-level. This lake is fed by the western Guaso Nyiro which comes down from the Mau escarpment. At the point where it enters the lake there is a large swamp. The extinct crater of Shombole is on the left bank of the river and falls down sheer into the lake at its north-east corner. This southern part of the valley from beyond the frontier to the north of Lake Magadi is known as the Ol Dogilani Plains. It is dry and waterless except along the course of the Guaso Nyiro, which is marked by a line of vivid green vegetation. Lake Magadi lies at an altitude of 2,034 ft., and comprises an area of 30 square miles. Its surface is curiously divided into long finger-shaped bays. Properly speaking, it is not a lake at all, but an immense deposit of raw soda, level, dry, and hard, rather like dirty snow in appearance with a pinkish tinge.

The depth of the soda deposit is not known, but borings have been made to 20 ft. The lake can be walked across, and a light railway is laid down upon it. The soda smells badly and is very destructive to boots. Hot springs are everywhere. They are charged with soda, and contain in solution a considerable proportion of solids. The bulk of the soda is due to the deposition from these springs (see 'Geology'). It is an accepted theory that large springs exist in the bed of the lake which intrude saturated soda liquor. On the removal of the soda this liquor rises to the surface, and after a few weeks the soda has re-formed. The lake is ringed round with bare brown mud flats on which are considerable deposits of silica. The country is arid, and the heat intense.

After the rains the whole lake is covered with water, in depth from 6 in. to 1 ft., but it very quickly disappears.

Separated by a narrow strip from the northern bay of the lake is the small soda-lake of Engeramai. To the east of this there is a hot spring with a temperature of 149° F. The volcanic Lenderut Hills lie to the south of Lake Magadi, and the extinct crater of Lorgasailieh to the north-east.

In the next basin northwards the lake has disappeared and its place is taken by a level sandy plain, with the river Kedong flowing through it until it disappears in a swamp at the foot of the eastern escarpment opposite Ngong Hill. From this plain rise the splendid volcanic craters of Suswa and Longonot. Suswa is the most remarkable of the valley craters as Longonot is the largest and most perfect. The name Suswa is wrongly applied to the mountain, and belongs properly to the plain which lies between it and Longonot, about 18 miles to the north-east. Its true name is Ol Donyo Nyukie or the Red Mountain, from the red andesite and rhyolite of which it is composed. On the north and north-east side the plain heaves itself up until the grassland penetrates right into the crater; but elsewhere, especially to the south-east, it is very precipitous and broken, a mass of lava blocks. The crater consists of a circular trench, surrounded by a rim or plateau-ledge, and containing within it a circular island,

2 or 3 miles across, and covered with cedar trees. The trench is about 200 ft. deep and filled with bush. Steam jets rise from its floor, and also from the flat rim which encircles it. On the southern side there is a peak overlooking the trench, and constituting the summit of the mountain, 7,870 ft. in height. The base of Ol Doinyo Nyukie is 9 miles in circumference.

Longonot, the sides of which are curiously scored with gullies, rises to a height of 9,350 ft. above sea-level and 3,000 above the floor of the valley. It has a peak similar to that of Ol Donyo Nyukie, and in the same position. The interior of the crater is a large and fairly level plain, covered with acacia scrub. On the inner face of the north wall is a big steam vent. To the south of the mountain there are a number of lava beds, standing on the floor of the valley like tables.

Opposite Longonot to the east is Mount Kijabe with its famous gas hole. The emission of the gas is periodic. It is specially active between 3 and 5 o'clock in the afternoon. Cattle are attracted to it, as the gas condenses and crystallizes to form a salt lick. It kills sheep and dogs in 40 seconds, and six dead buffaloes have been found lying there. It has now been fenced in. Kijabe is a spur from the main wall of the eastern escarpment, but rises to a separate peak of its own, 7,300 ft. in height. Between it and Mount Longonot there is a connecting ridge, across which a pass leads northwards into the next basin of the valley, containing Lake Naivasha. At this point the valley turns in a north-westerly direction.

Lake Naivasha is situated at an altitude of 6,135 ft. above sea-level, and the country round it, as already stated, is the most elevated portion of the Rift Valley. It is also the only lake in the valley the water of which is fresh and drinkable. There is said to be an outlet underground at the south-west corner, where the water can be distinctly heard running away.

Due south of the extreme southern bay of Naivasha is a remarkable dry valley called Enjororowa. It follows a winding course in a south-west direction for about 8 miles,

and is evidently an old outlet of the lake. The floor of the valley at its intake is 130 ft. above the surface of the lake, which evidently once occupied a much larger area (see 'Geology').

The lake is fed by the rivers Morendat and Gilgil which enter it from the north. The former has cut a very deep channel in the plain, and flows in a narrow chasm, the sides of which are covered with trees and grass.

On the western side of the lake, between it and a projecting spur of the Mau escarpment, lies the beautiful little plain of Endabibi. To the north-west is the great volcanic pile of Eburu (El Buru) (8,900 ft.) with a series of steam vents on its northern slopes.

Beyond this the next basin is occupied by two lakes, both salt, which probably formed at one time a single sheet of water. The first is Lake Elmenteita, 6 miles long by 2 broad, the shores of which project in rocky capes and headlands. All round the south end is a big area of swamp, on account of which the Uganda Railway has to make a détour to the south between the stations of Gilgil and Elmenteita. Lake Nakuru, a few miles to the north-west, is considerably larger than Lake Elmenteita, being 9 miles long by $4\frac{1}{2}$ broad. Two rivers, the Enderit and Magalia, enter the south end of the lake, and the river Njoro comes in on the north-west, where the town of Nakuru is situated. On this side, to the north of the town, is the crater of Menengai, reputed to be the largest crater in the world. It is only towards Nakuru that the crater wall rises above the surrounding country. On the other three sides there is a sheer drop from the level of the plain to its floor, which is covered with dense bush.

From Nakuru the valley runs almost due north and south. The next lake in the series is that of Solai or Kibibi. It is small and shallow, and occupies a secondary rift valley in the floor of the main valley from which it is separated by a ridge. The height at the southern end of this ridge is called Equator Peak and is almost on the Line. Lake Hannington or Losuguta, about 9 miles north of Solai, also lies in a Rift

valley of its own between the Laikipia escarpment and a ridge of volcanic rock, and is said to be the most beautiful and interesting in the whole series. The water has a putrid sulphurous flavour and is lukewarm. There are numerous dead trees along its banks, and acres of yellow rotten grass killed by the flooding of the chemically-charged waters.

The floor of the valley, which up to this point has been declining from its highest elevation round Lake Naivasha, past Elmenteita (5,880 ft.), Nakuru (5,845 ft.), Solai (4,820 ft.) to Hannington (3,050 ft.) here rises slightly to Lake Baringo which lies at an altitude of 3,325 ft. This lake is the most northern of the valley series, and is also the largest, being 15 miles long by 8 broad, and covering an area of 100 square miles. The Rift Valley at this point is scarcely more than 18 miles across between the escarpments of Laikipia to the east and Kamasia to the west, the lake being rather nearer to the Laikipia side. The water of Lake Baringo is only just drinkable. At its southern end there is dense thorn jungle, and on the south-west a number of small swamps with elephant grass. The Molo river, which rises in the Mau highlands and traverses the Rift Valley in a northerly direction, enters the lake from the south across the green steppes of Njemps. Just before it enters the lake it is joined by the Tigrish river, which rises near Eldama ravine and flows into the Rift Valley to the west of and roughly parallel with the Molo. At the south-east corner of the lake the Ol Arabel river or Guaso Boli comes in from the Laikipia escarpment. The islands in the southern part of the lake form a circular archipelago and are probably the remains of a crater. On the largest of these islands there are pools of warm water, smelling slightly of sulphur. They vary in size, the largest being 10 ft. in diameter and 20 ft. deep. Some of the smaller ones throw out an intermittent jet of steam, while others are continually on the boil. The Erri mountains rise steeply from the northern shore of Lake Baringo in a series of cliff-faced terraces. The pass across these mountains to the north may have at one time formed an outlet for the waters of the lake.

The view northwards from these heights embraces a long stretch of desert sloping down to Lake Rudolf 90 miles away. A noticeable feature of this part of the valley are the numerous dry watercourses which the torrential rain of March and April transforms into great rivers, so that half the country is under water. The soil, however, is so sandy and porous that the water has soon all disappeared. For the rest of the year this country is arid and intensely hot, a forbidding region of sparkling salt steppes and tracts of lava very difficult to cross. The grazing, however, is stated to be excellent, but owing to the precarious water supply the natives are compelled to live a nomad existence. The river Sugota which flows through this region is a remarkable chalybeate stream. Its source is some hot springs on the Erri mountains. In the upper reaches lines of magnificent date palms mark its course. Lower down it is bounded by great lava walls, sufficiently lofty to prevent all possibility of the river flooding the surrounding country. After running on for 70 miles without widening it disappears underground. As to Lake Sugota, some authorities assert that it has no existence, and suggest that the white natron deposits in these parts have been mistaken for a lake in the distance ; others report that it is quite a large sheet of water. It seems most likely that it is a lake in the rains, but has little or no permanent water.

Immediately to the north of this is Lake Rudolf, which lies at an altitude of 1,250 ft., nearly 5,000 ft. below the level of Lake Naivasha. It has an area of 3,970 square miles, a length of 185 miles, and a greatest breadth of 37 miles. It occupies the centre of an inland drainage system comprising southern Abyssinia, the northern part of the highland plateau of British East Africa and the Turkana country. Though there is a wet weather and dry weather level of the lake, there is no doubt that it is steadily shrinking. In Alia Bay there used to be islands which are now hills half a mile inland. On the western shore numerous lagoons, formerly teeming with wild fowl, are now dry, and there are no birds. Sanderson's Gulf in the north-west corner is very shallow, and the two horns or

spits which form it appear to be closing. The water of Lake Rudolf contains salt and soda, and is only just drinkable. It is especially bad at the southern end, but better at the northern owing to the inflow of the river Omo. Like the other lakes of the Rift Valley it has no visible outlet. It is very shallow in the north, but deeper in the south, where soundings of 24 ft. have been obtained. The southern end is shut in on each side by high lava cliffs, and here on the southern shore is Teleki's volcano or Luburua, said to have been in eruption within recent memory. To the south-east of this lie Ol Donyo Ngiri or Sil and Ol Donyo Mara, the former a square-shaped, flat-topped mountain, 10,000 ft. high, which continue the line of mountains from the highland plateau. This line, as previously stated, extends up the east side of the lake. Here the principal height is Mount Kulal (7,812 ft.), remarkable for the stupendous cleft which cuts the mountain in two down the middle of the summit. The chasm is 3,000 ft. in depth and 100 ft. broad. The summit of Kulal is forest-clad, but the water supply is very limited. About 70 miles NNE. of Mount Kulal is Mount Longendoti. The country in between is forlorn and desolate, covered with little flat-topped hills and lava plateaux. Near Longendoti it is intersected with deep ravines. The mountain itself is situated to the south of Alia Bay, and falls sheer down into it. From here northwards the shore of the lake continues mainly flat with occasional lava ridges, and numerous dry watercourses.

There are three volcanic islands in the lake, North Island or Muronaithe, 26 miles NNW. from Alia Bay, Central Island or Choro, 11 miles west of Mount Longendoti, and South Island or El Molo, opposite Mount Kulal, 4 miles from the eastern, and 6 from the western shore. The two first are quite small, but El Molo is about 4 miles long by 2 broad.

The Walls of the Rift Valley.—The Rift Valley is bounded by two roughly parallel lines of cliffs. The fall is by no means always precipitous as the term 'wall' would suggest. Though in places it is absolutely unscaleable, there is often a grass-clad slope with a comparatively gentle gradient.

At several points loaded animals can descend into the valley without much difficulty. Generally speaking, though with marked exceptions, the western wall descends in a single slope, whereas the eastern wall is terraced in a very striking manner with cliffs and intervening platforms, varying in breadth from a mere ledge to a considerable plain. The number of scarps varies: sometimes there are only two, normally there are three, and in places more. The upper scarps are intersected with numerous ravines which pass across the first platform in narrow V-shaped gorges. As the rainfall steadily diminishes from top to bottom, the ravines become less definite as they get lower, and finally pass out on to the floor of the valley broad and shallow.

The eastern wall disappears a little south of the southern frontier, and throughout Tanganyika Territory is never sharply defined. Northwards it becomes much more definite. Opposite Lake Magadi it descends in a series of steps, scarp after scarp. Here the descent into the valley is not continuous, long fault block ridges, the summits of which form narrow plains, presenting precipitous escarpments on both sides. These ridges often continue for many miles. In one place the Magadi Railway, descending from the Kapiti Plains, has to make a long *détour* to avoid one of these opposing ridges, the crowning mass of which is Mount Shelford (see 'Geology'). This formation extends as far north as the hill of Ngong or Lamwea, which stands out at the end of a long straight cliff wall, and marks the southern termination of the precipitous Kikuyu escarpment.

Due east of Suswa (Ol Donyo Nyukie) a spur projects into the valley, immediately north of which the eastern wall recedes into a great embayment. It is here that the Uganda Railway descends. At the point where the line crosses the edge of the Kikuyu escarpment, the height above the floor of the valley is about 1,500 ft., and there are two terraces from 400 to 500 yds. broad. The northern horn of the embayment is formed by Kijabe hill which rises at the end of another spur running out from the main wall.

Opposite Naivasha the single escarpment has been replaced by two, the first a long low cliff rising about 40 ft. from the valley, on the top of which is a mile or two of flat plain with grass and cedar trees, and then a more imposing escarpment 100 ft. high. At the summit of this is the plateau of Kinangop, an undulating grassy plain bounded to the east by the Aberdare Range. This plateau extends northwards from Kijabe hill for about 30 miles to the wooded height of Kipipieri, a great outlying mass of the Aberdares, 11,000 ft. in height. It is traversed by a number of streams which flow in gorges so deep and narrow that in most places it is impossible to get down to the water. They run in a westerly direction from the Aberdares, and are all tributaries of the Morendat. At Kipipieri the trend of the eastern wall of the Rift Valley becomes north-west, and this direction is maintained until Lake Elmenteita is reached, when the trend becomes NNW. The change in direction to the north-west is not produced by the curving of the faults, but by the Naivasha faults dying out, and a new set of scarps forming to the west. Of these the chief one runs along the east side of Lake Elmenteita. Another scarp rises immediately to the north-east of Gilgil Railway Station and is continuous with the higher scarp of Sabugo Rongai and Sabugo Loldian. Between this western set of scarps and the Aberdare Range to the east a number of valleys run up northwards, in each of which there is a stream descending to the Morendat and Gilgil rivers, and so into Lake Naivasha. These valleys rise up into the Angata Pus, the plain which lies between the Aberdares and Sabugo Loldian. The Angata Pus is bounded to the east by a precipitous scarp known as the Laikipia Scarp, which runs north-east from Kipapieri. The northern end of the Aberdare Range rises immediately above this scarp, but is perfectly distinguishable from it.

From this point the eastern wall of the valley bears the general name of the Laikipia Escarpment.

The two scarps already mentioned as taking their rise to the west near Gilgil Station run northwards past Lake Solai.

Four miles north of Lake Solai the more westerly of the two disappears, and is replaced by another which appears on the west, and increasing in height, in a northerly direction, forms the stupendous cliff on the east side of Lake Hannington. This is the highest and steepest in the whole valley, forming a precipice of 1,900 ft. Beyond the north end of the lake it slowly decreases in height, and sinks into the plain south of Lake Baringo. Meanwhile the more easterly scarp, which forms the higher feature of Sabugo Loldian, bends round to the north-west in a great embayment, until, opposite the northern end of Lake Hannington, it turns north, and forms the scarp immediately to the east of Lake Baringo. The plateau above this is covered by forest in which there are large grass clearings. It is watered by several streams flowing towards the north-east in deep gorges. Opposite Lake Baringo the valley is bounded by two steep and lofty scarps separated by a broad terrace. North of this the eastern wall steadily declines, and loses its character as an escarpment.

The western wall is, on the frontier, more clearly defined than the eastern, and is here known as the Nguruman escarpment. From the summit the drop is abrupt with a second escarpment lying like a shelf at its foot. West of Lake Magadi there is a plateau between the main escarpment and the floor of the valley, well watered by permanent streams, and inhabited by the Nguruman Masai. The fault block ridges already described as forming the eastern wall of the valley above Lake Magadi appear also on the western side. The formation is particularly impressive above Lake Engerama, where the ridges enclose valleys with precipitous sides several hundred feet high. To some of these valleys there is no outlet, and if the rainfall was large they would become lakes. North of this the western wall becomes known as the Mau escarpment, and is thickly forested. Though higher than the Kikuyu escarpment on the east side of the valley, the descent is for the most part more sloping and less impressive, and there are none of the terrace formations which are so striking

a feature of the eastern wall. The broad stretches of forest and grass on the Mau escarpment are very pleasing, but the finer views are said to be those of the eastern side of the valley from the west. Opposite Lake Naivasha the Mau escarpment bends to the north-west. In the neighbourhood of Lake Nakuru there is an enormous projecting spur which descends in a steep cliff and forms the western bank of the lake. To the north of this there is a slope of open rolling country up which the Uganda Railway ascends along the valley of the Njoro river, the wheat-growing centre of the Protectorate. There is a rise of 1,000 ft. in the 12 miles which separate Nakuru from Njoro Station. Here the railway leaves the river and enters the cedar forests of Mau which extend down the escarpment to about 7,600 ft. above sea-level.

Opposite Lake Hannington the western wall forks and forms two immense escarpments separated by a deep depression—a secondary Rift Valley. The western and higher of the two is the escarpment of Elgeyo, the eastern and lower that of Kamasia. The Kamasia escarpment rises to the west of Lake Baringo and consists of a series of terraces, exceedingly steep and bare. A number of foothills intervene between its base and the lake. At the summit of this escarpment is a narrow wooded plateau with an elevation of between 7,000 and 8,000 ft. on which is situated the post of Kabarnet. To the west it descends steeply into a deep and narrow valley, this western slope of Kamasia in contrast to the eastern being well watered by numerous brooks. The valley is closed at its southern end by lofty mountains, and runs first north by west, and then almost due north between the great ‘walls’ of Elgeyo and Kamasia. It is traversed by the Ndo or Kerio river, which rises in the mountains at its head, and flows northwards past Lake Kamnerok through the Suk Plains to Lake Rudolf. The valley is dry and its vegetation semi-arid. The elevation of its floor is slightly higher than that of the main Rift Valley to the east of it, Lake Kamnerok lying at an altitude of 3,500 ft., whereas the altitude of Lake Baringo is 3,325 ft. The Elgeyo escarpment bounds this

valley on the west with a towering wall of rock 3,000 ft. above it, and except in a few places is quite inaccessible. Its general altitude is from 8,000 to 9,000 ft., and the summit is fringed with a broad belt of forest containing the best timber in the Protectorate. The view from Elgeyo is very fine and extends across the narrow Kamasia plateau to the distant line of the Laikipia highlands on the eastern side of the Rift Valley. The Elgeyo escarpment bends round to the north-west, where it terminates in a lofty ridge of nearly 11,000 ft. The Kamasia plateau continues almost due north, declining in level to the Kito Pass, 34 miles north-west from Baringo, which leads from the Rift Valley to the Suk Plains. Beyond this is the northward extension of the plateau, known as the Taiti Hills, which run north and south for nearly 40 miles, with a greatest elevation of 7,700 ft. North of Elgeyo the Rift Valley broadens out into a great plain, its western boundary passing across the eastern slopes of the Suk Mountains and over the river Turkwel into Uganda, where it is continued by the Langetelio or Chemorongi Range.

THE WESTERN HIGHLANDS AND THE VICTORIA NYANZA

The country to the west of the Rift Valley is part of the highland zone and consists of a series of plateaux. They have a higher altitude than the corresponding plateaux to the east of the valley, and are also much more heavily wooded. Forest extends all along the Mau escarpment and continues unbroken to the northern end of Elgeyo.

On the frontier to the south is the high tableland of Ndasegara, 8,300 ft. in height, sloping down to the west in a succession of wooded ridges to the valley of the Mara. North of this is the great mass of Osubogo Lo Loita, 8,000 ft. in height, overlooking the Loita Plains. These latter consist of miles of open rolling downs with considerable patches of bush and trees, and near the streams a good deal of scrub jungle very difficult to penetrate. After the rains they are covered with luxuriant grass, but this is soon grazed down, and in the dry season the country is brown and waterless. North of the

Loita Plains is a long slope which forms the southern flank of the Mau plateau and is known as Endima Mau. At first it is open country with undulating grass spurs, intersected with deep wooded ravines. Higher up there is thick forest. This slope is drained southwards by the Guaso Nyiro and its tributaries, which descend into the Loita Plains and thence into the Rift Valley.

The plateau of Mau extends northwards from the Loita plains across the Uganda Railway to the mountains which lie to the north of Eldama Ravine Station at the head of the deep valley between the Elgeyo and Kamasia escarpments. It is bounded on the east by the Mau escarpment of the Rift Valley. The general elevation of the plateau is from 8,000 to 9,000 ft., but in places it reaches altitudes of 10,000 ft. The rainfall upon the Mau plateau is very great, as it is the meeting-place of the rains from the Congo area to the west, and from the Indian Ocean to the east. It is covered with dense forest, which extends backward from the escarpment for distances varying from 30 to 70 miles. In places, chiefly at the higher altitudes, there are stretches of open grassy country. The Uganda Railway after climbing up from the Rift Valley through the Mau forest enters in the neighbourhood of Molo a stretch of open rolling hills rising to 10,000 ft. above sea-level, where the pasturage is excellent and the country well watered with permanent streams which flow generally over rocky beds. In the immediate vicinity of Mau Summit the scenery is downlike, bare and open, and quite treeless. The district of Mau Narok or Black Mau, so-called from the colour of the soil, is a similar tract of open grassy country. It lies about 14 miles to the south of the railway at Elburgon and immediately to the north of the Endima Mau. In many places in the forest there are grassy glades or 'forest opens', spaces of short grass, walled round with densest timber. The plateau is intersected with numerous streams running through steep gorges or boggy hollows, which carry off the great rainfall to the Nyando, Sondo, and Mara rivers, and so into the Victoria Nyanza. The principal streams which descend into the Rift

Valley are the Guaso Nyiro, the Molo, and the Tigrish or Tigeri rivers. The first of these has already been described. The Molo rises near the station of that name on the Uganda line and flows north-east to Lake Baringo. From the point where it leaves the Mau forest the valley of the Molo is very fertile, and is a rich grain district. Lower down the river enters a deep valley, flanked on each side by lava scarps where there is no room for cultivation. The Tigrish has its source in the Nandi country to the west of Eldama ravine, and descends through a deep gorge to the Njemps Plain, where it joins the Molo. Between these two rivers is an extensive lava plateau.

The Lumbwa country lies behind the Mau forest to the west. The official district of Lumbwa extends southwards from the Uganda line to the frontier, but the Lumbwa country proper is only the northern portion of this. It is a broken and hilly district, fertile and well watered, open for the most part but with strips of forest. Twenty miles south-west of the station and township of Lumbwa on the Uganda line is the post of Kericho. The scenery here is very like that of Kikuyu, numerous streams flowing in deep wooded gorges forming a constant succession of ridges and valleys. These streams flow south-west, continuing the slope of Mau, and are tributaries of the Nyando. The altitude of the country round Kericho is from 6,500 to 7,000 ft.

To the south of Lumbwa is the Sotik country bounded on the east and north-east by the forests of Mau, on the west by the Kisii highlands, and on the south by an uninhabited region extending to the frontier. The scenery is very much the same as it is in Lumbwa, but if anything it is finer, and the country is more fertile, and even better watered. Thickly wooded hills alternate with open parklike plains and along the rivers there are belts of forest. The richest part of the Sotik country is in the neighbourhood of the Chepalungu Forest some 50 miles south of Kericho. The Indanai Hills to the west of the forest, towards the Kisii highlands, are said to be extraordinarily fertile. This is the only part of the Sotik where there are white settlers at present. Numerous streams traverse the

country descending from the Mau Forest. Those to the north flow in a general westerly direction to form the Sondo : those to the south flow south-west to form the Mara. Both these rivers are swift and deep, and except in a few places unfordable. The Sondo river flows northwards, dividing the Sotik country from the Kisii highlands, round the north-eastern end of which it bends towards the west and enters the Kavirondo Gulf. The Mara, the second largest river which enters the Victoria Nyanza, is formed by the junction of the Nyangoris and Amala rivers which come down from the Mau highlands south-westwards through the Sotik country, and unite to the south-east of the Chepalungu Forest. The country enclosed between these two streams is very hilly, and has a general elevation of about 7,000 ft. On the left bank of the Amala a line of thickly wooded heights separates that river from the water system of the western Guaso Nyiro. The Mara, which is also known as Engare Dabash, flows first south-west, and enters a wide valley across which it turns south. The valley is bounded on the east by forested ridges behind which lie the Loita Plains, and on the west by the long line of the Loongarya and Isuria escarpments. These escarpments run NNE. and SSW., starting to the south of the Chepalungu forest and continuing across the frontier with a general altitude of over 6,000 ft. Nearly all the water from the escarpments flows south and west, and only dry river beds join the Mara from the east. Consequently, except along the course of the Mara itself, the valley is badly watered, and its broad plain is uninhabited. The view from the Isuria escarpment on the frontier is very fine, range after range of hills rising to the west towards the continuation southwards of Mau. Beyond the frontier the Mara takes a wide sweep to the west, and debouches into the lake not far south of Shirati.

As already stated, the Uganda line forms the northern boundary of the official Lumbwa district. The railway does not, of course, constitute a geographical division, but the Nyando Valley, which it follows, is a well-marked break. It is a deep cleft between two hilly tablelands, and taken in

connexion with the Kavirondo Gulf into which it opens, and the line of the Nandi escarpment which borders it to the north, divides the country west of the Mau plateau into two parts. The streams forming the Nyando come down from the mountains which close the end of the valley between Elgeyo and Kamasia, and flow south along the Mau plateau as far as Londiani. Here they form the river Kipchoriet which turns westward and, gathering streams from the Lumbwa country and the Nandi escarpment, becomes the Nyando or Bagamoyo river.

The Uganda Railway, following this valley, descends from Londiani to Fort Ternan in a series of precipitous curves through a park-like country, consisting of grassy hills with scattered trees. Fort Ternan marks the limit of the highland zone upon the railway to the west; its altitude of 4,980 ft. above sea-level, and its climate almost exactly corresponding with those of Kiu, the station which is generally considered to mark the beginning of the highlands on the eastern side. Just beyond Fort Ternan the valley turns WNW. At Muhoroni the railway bridges a deep grassy glen where calcareous springs are still active. There are many European settlers here, and large plantations exist in the neighbourhood. At Kibigori the railway crosses an important tributary of the Nyando coming down from the Nandi escarpment, and proceeds to its terminus at Kisumu, over a level and fertile plain very swampy in places and once covered by the waters of the lake.

Kisumu, formerly Port Florence, is 584 miles from Mombasa by railway, and has an altitude of 3,756 ft. It is situated practically on the Equator, and is built on a saddle-backed hill at the head of the Kavirondo Gulf. This is a huge backwater of the Victoria Nyanza, almost exactly bisecting that portion of the north-eastern shore of the lake which lies within British East Africa. The gulf extends inland to the east for a distance of 45 miles, and has a breadth varying from 18 to 12 miles. Its waters are muddy and dirty, and its depth is nowhere great. Kisumu lies up an arm of the gulf at its north-east corner. From the southern termination of this arm the low

flat swampy shore trends south-east for more than 10 miles to Nyakach Bay, deeply inserted in the south-eastern corner of the gulf. This bay forms the estuary of the Nyando which enters it through a vast swamp coming down from the north-east across the broad level plain already mentioned. On the western side of the bay is the low alluvial peninsula of Sangu, swampy in places and intersected by the river Sondo or Miriu which here debouches into the gulf. West of this, the southern shore runs in a general east-and-west direction for 21 miles to Homa Point. As far as Kendu there is only a narrow strip of plain, dotted with villages of the Kavirondo tribe, and the ground rises almost at once towards the south, but between Kendu and Mount Homa there is quite an extensive plain. It is bare and open, with here and there small isolated cones of basalt rising abruptly from it, and contains the curious crater-lake of Simbi (see 'Geology') which occupies a depression on a low rounded hill just south of Kendu Bay. Mount Homa is an isolated volcanic bluff, 5,742 ft. in height, jutting out westwards into the gulf and overlooking the deep indentation of Homa Bay. Here the entrance to the gulf is blocked by the rocky peninsula of Uyoma which projects from the northern shore and terminates in a low flat-topped headland known as Uyoma Point. Between these two promontories the channel turns south-west, and is 6 miles from shore to shore at its narrowest. On the other side of Homa Bay, south-west of Mount Homa, are the fantastic cones of Ruri (5,563 ft.) and Sahanga (4,790 ft.), and farther to the west across an intervening plain is the rugged volcanic range of Kasagunga. These mountains are the northward termination of a lofty basalt plateau which extends southwards as far as Karungu Bay, and falls down in precipitous cliffs into the lake on the east. The entrance of the gulf between the narrow bush-covered shore underneath the northern slopes of Kasagunga and the Uyoma peninsula opposite, is about 3 miles in breadth. Immediately outside it is blocked by the large island of Rusinga (Lusinga), to the south-west of which lies the somewhat larger island of Mfwanganu. Both rise steeply from

the lake, and like all the islands on this part of the coast are outposts of the volcanic plateau on the mainland. There are two channels from the gulf into the lake. The Rusinga channel, to the north-west, has a breadth of a mile and a quarter between the northernmost point of Rusinga Island and the Mogari Islands adjacent to the Uyoma peninsula. The southern channel, between Rusinga and the mainland, is known as Mbita passage. It is narrow and tortuous, but nowhere less than 11 fathoms in depth. South of the Mbita passage as far as Karungu the coast consists of lofty terraced cliffs, the lower slopes of the huge volcanic mountain of Gwasi (6,384 ft.) which rises inland 3,000 ft. above the lake, and is the highest mountain bordering the Victoria Nyanza. The 100-foot line runs nearly north and south close to this part of the coast, and a depth of 250 ft. has been recorded only half a mile from the shore. South of the cliffs of Gwasi the coast recedes south-east and forms the wide bay of Karungu, the shores of which are low-lying, swampy, and unhealthy. Inland, behind the swamps, is a dreary expanse of bare grassy downs and flat-topped hills with intervening rocky spurs from the basalt plateau to the north. From Karungu Bay the coast trends SSW. to the deep inlet of Gurekeri Bay, on the other side of which the bold promontory of Mohuru juts out into the lake for 7 miles. It is surmounted by a line of rocky hills with large granite boulders upon their summits, a spur of the Bingu hills which lie upon the frontier.

Inland between Mohuru and the Mara valley are bare hills and rolling downland. In the neighbourhood of the lake there is much thorn bush. As the levels rise this disappears, and there is grassland with patches of acacia forest.

To the north of this uninhabited region is the valley of the Kuja river. It rises in the Kisii highlands, which lie some 35 miles to the east of Karungu, and is a swift stream with numerous waterfalls. In marked contrast to the barrenness of the surrounding country its banks are clothed with dense vegetation. Leaving the Kisii highlands through a deep gorge it flows westwards across a fertile country where there are

numerous Kavirondo villages. Then bending round to the south-west it encloses a district of steep isolated hills and picturesque crags, such as the crags of Metamala. To the north is a wide bare treeless plain separating the Kisii highlands from the volcanic mountains of Gwasi. The Kuja issues from this rugged district over the falls of Gogo, and enters a broad, alluvial, and much cultivated plain, reaching the lake to the south of Karungu Bay.

The Kisii highlands consist of an elevated plateau of grassy treeless downs, rising south and east to altitudes of over 7,000 ft., and carved into wide valleys by the Kuja and its tributaries. The climate is healthy and the pasture excellent, while there is an abundance of good water and perennial streams (see 'Geology').

The plateau is bounded on the south-west by the Vinyo escarpment, a great cliff rising 1,000 ft. above the plain of Kamagambo at its foot, and breached by the gorge of the Kuja. To the north-west it is bounded by the Manga escarpment, an imposing line of precipitous cliffs at the foot of which is the densely populated district of Kitutu. The station of Kisii is situated at the south-west corner of this escarpment. From here the country falls down in a succession of terraces to Kendu on the southern shore of the Kavirondo Gulf, a distance of 28 miles.

The northern shore of the gulf trends in a WSW. direction to the Uyoma peninsula, the plain behind it being much broader than it is on the southern side. It is bare and treeless, with considerable areas of swamp. To the north the Maragoli Hills, a long spur from the western end of the Nandi escarpment, stand round it in a vast semicircle. Beyond these hills, in the North Kavirondo district, is an open breezy country of fine rolling downs. As Mumias is approached this gives place to ridges and hills with immense boulders and outcrops of rock, presenting rather a dreary and desolate appearance. North Kavirondo is a well-watered and exceedingly fertile land with a population of about 300,000. Except along the shore of the lake, and in a few other localities, of which Mumias is one,

it is a healthy country. The general elevation is from 4,000 to 6,000 ft. At one time it was probably covered with forest, but it is now almost treeless. It is traversed by the only three rivers which enter the northern part of the Victoria Nyanza, the Yala, the Nzoia, and the Sio. The Yala comes down through a gap in the Nandi escarpment, and passes to the north of the Maragoli Hills. For the last 17 miles of its course it runs through the immense Yala Swamp which extends to the shores of the lake. Three miles separate the mouth of this river from that of the Nzoia to the north of it. The Nzoia comes from the Uasin Gishu plateau and crosses North Kavirondo in a south-westerly direction. It is the largest river entering the lake within the limits of the Protectorate. The Mara is larger, but though it rises in British East Africa, it enters the lake to the south of the frontier. The current of the Nzoia is very rapid : it is unnavigable, and can only be forded in places from December to February. The Sio river flows south-west from the high Kitosh country to the south of Mount Elgon, and forms for the last 12 miles of its course the frontier with Uganda. Here it is a sluggish stream draining a flat and swampy plain. It is separated from the valley of the Nzoia by the Samia Hills (5,000 ft.) which rise at the end of a long ridge of elevated country running south-west from Elgon.

The lake shore of this district is low, flat, and unhealthy. From Uyoma Point it trends north-west to the entrance of Berkeley Bay, and is deeply indented with numerous bays and inlets. Of these the largest is Kadimu Bay, an arm of the lake which recedes inland for 7 miles from the general line of the coast in a north-easterly direction. Mageta Island lies just outside its entrance. Three miles north-west of the mouth of the Nzoia begins Berkeley Bay, which is situated in the north-east corner of the lake, partly in British East Africa and partly in Uganda. Here the shore line trends NNE. for 12 miles to the mouth of the Sio river. Opposite the point made by this change of direction is Sumba Island lying across the entrance of Berkeley Bay, and between it and the shore is Sumba channel, $2\frac{1}{2}$ miles wide. Immediately to the north-

east of this point a bay is formed, on which is situated Port Victoria. This place was intended at one time to be the terminus of Uganda line. It holds the advantage of Kisumu in being on the lake itself instead of lying at the head of a long shallow gulf. The approaches, however, are said to be difficult.

The centre of this North Kavirondo district is the large village of Mumias. It is situated on a comparatively low ridge to the south of the Nzoia river, some 48 miles north-west of Kisumu by road. The soil is exceedingly fertile, and a considerable amount of tree planting has been carried out, but the place is very unhealthy.

Northwards from Mumias there is a steady rise in level towards Mount Elgon, while to the east there is a continuous slope to the foot of the precipitous western face of the Nandi escarpment. In this latter direction the country becomes better wooded, and there are patches of forest, notably the beautiful Kakamega Forest.

The Nandi escarpment comes down from the NNW. almost to Kisumu, just to the north of which it bends round to the east. On its western face, overlooking the Kavirondo country, there is thick forest, but its southern face overlooking the Nyando valley is bare, rugged, and precipitous, with serried columns of lava flows piled one above another. Long spurs project into the valley below, such as the immense volcanic mass of Tindaret, 8,663 ft. in height, which stands out from the face of the escarpment above Fort Ternan. North of Kisumu the altitude of the escarpment is between 6,000 and 7,000 ft., and it rises nearly 3,000 ft. above the level plain at the head of the Kavirondo Gulf. Farther east there are elevations of over 9,000 ft., while Eldama Ravine Station, situated on a spur, which projects from its eastern extremity into the forests of Mau, is 7,145 ft. above sea level. Two and a-half miles south-west of the station the Eldama river emerges from the forest into a steep gorge, and it is from this ravine that the place derives its name. The Eldama river is a tributary of the Tigrish. The whole of this district is

covered with fine forest, containing some of the best timber in the Protectorate.

Eldama Ravine Station is 20 miles north-east of Londiani on the Uganda line. To the south-east is Mount Eldalat (7,872 ft.), a volcanic cone overlooking the valley of the Molo river. A stream running east and west has cut a ravine in the east flank of the mountain almost down to its base. To the north is a great mass of mountains 9,000 ft. high, which lies across the head of the Kerio Valley between Elgeyo and Kamasia. They are deeply dissected by a complicated system of ravines. To the north-west lies a forest region, consisting of a succession of lofty ridges, between 8,000 and 9,000 ft. above sea-level, with intervening valleys which are often swampy. Beyond there is the Uasin Gishu plateau.

The Nandi country at the summit of the escarpment of that name is considered to be the most beautiful part of British East Africa. It is a hilly and undulating country, thickly forested in parts, with open spaces of good natural pasture exceedingly well watered. To the north of the Nandi country is the Uasin Gishu plateau, a fertile tract of open rolling plains, covered with short grass, 90 miles long by 30 miles broad. The plateau is for the most part treeless, except in the sheltered hollows, which are filled with indigenous cedars, very valuable for building material, as they resist the ravages of the white ants. The change of scenery from the wooded hilly Nandi country to the great bare levels of the plain is very abrupt. It is bounded on the east by the fine forests which fringe the Elgeyo escarpment. On the west it overlooks the Kavirondo country, from which it is separated by a slope, comparatively gentle in the north, but becoming much steeper towards the south, where it merges in the precipitous Nandi escarpment. On the north the plains are bounded by deep valleys, clothed with forest, which separate them from Mount Elgon on the north-west, and the Chibcheranan or Cherangani Mountains on the north and north-east. The general elevation of the plateau is between 6,000 and 7,000 ft. It slopes upwards from west to east with

an average gradient of 40 ft. in the mile to within 15 miles of Elgeyo, when the rise increases to 70 ft. in the mile to the north, and 100 ft. in the south, culminating in altitudes of 7,500 and 8,500 ft. respectively. A few isolated hills rise abruptly from the level plain, the most conspicuous being the four-peaked hill of Sirgoit, 7,657 ft. above sea level, an unmistakable landmark from any position in the centre of the plateau. A small lake lies a few miles to the north of it. There are no native tribes at present in occupation of the plateau, but there are signs of a former numerous population. All over the plains are circular hollows, from 20 to 30 ft. in diameter. Looking across the plains in every direction can be seen clumps of undergrowth and tall grass, marking the semi-subterranean dwellings of a vanished race. In many cases trees of a considerable height and age are found growing inside these hollows. The plains are traversed by several permanent rivers, all of which are tributaries of the Nzoia. This river rises in Elgeyo, and flows in a general westward direction with many winds and loops, until it descends into the Kavirondo country over Brodrick Falls. It divides the plateau into two parts. The country to the north of the river, known as the Trans-Nzoia, is sparsely populated, and large parts of it are considered unhealthy. South of the river the climate is excellent, and there are about 1,000 white settlers and a block of 600 farms. The centre of this southern part is the township of Eldoret, 75 miles from Londiani station on the Uganda line.

The Chibcharanan mountains, which bound the plateau to the north, are over 10,000 ft. in height, and covered in parts with dense forest. Numerous streams descend from them to join the Nzoia. The western slopes of these mountains approach the outlying foothills of Mount Elgon, leaving but a small area of plateau land between.

Mount Elgon is an immense isolated volcanic mountain, covering an area the size of Montenegro and dominating the Uasin Gishu plateau to the east, and a vast plain which stretches away from it to the north and west. It has no

well-defined summit, being crowned by an enormous crater, the interior of which, 10 miles in circumference, resembles a small plain surrounded by a circle of mountains. The highest point on the edge of this crater is 14,584 ft. Snow falls here, but does not lie long. It is crossed by a native track which passes through the crater plain and presents no special difficulties. The mountain is remarkable for its caves, which are found on the northern and southern slopes (see 'Geology'). They are close to the base of the great cliffs, which on all sides, except the east, mark the abrupt descent of the lowest terrace skirting the central crater wall. A number of these caves have their mouths concealed by waterfalls, and it is said that on an average there is a waterfall at every 5 miles round the mountain.

The frontier passes across Elgon diagonally from south-west to north-east, leaving the south-eastern part of the mountain in British East Africa. The finest scenery is on the western and northern sides which are in Uganda. The forest belt on the south and east of Elgon is not very large. It is thickest on the southern foothills above the Kitosh country. The eastern slope is comparatively gradual, and, as the rainfall is less abundant on this side, it is also the least rich in vegetation.

The bulk of the water from Elgon finds its way into the Nile, only a few streams, tributaries of the Nzoia, entering the Victoria Nyanza. Other streams unite to form the Turkwel or Suam river which flows northwards to Lake Rudolf. This river rises in the centre of the crater-plain of Elgon, and has carved a deep gorge through the crater wall, which presents a striking appearance from the east.

Beyond Elgon and the Chibcharanan Mountains there is a descent to the Suk Plains. They lie on the floor of the Rift Valley, some 2,000 ft. below the level of the Uasin Gishu Plateau, from which they are reached by the Marich Pass, between Seker, the highest summit of the Suk Mountains, and the lofty northern end of Elgeyo, both little short of 11,000 ft. in height. The Suk Plains extend from the river

Turkwel, on the north, south-west to Lake Baringo. That part of the plain which lies underneath the Elgeyo escarpment is fertile and cultivated. The numerous streams and cascades which descend from the escarpment have water in them for nine months in the year, but only one is actually permanent, the Kerut or Wei Wei river. This stream rising on the northern end of Elgeyo, and emerging on the plain near Marich, flows in a northerly direction to join the Turkwel. In the angle between the Kerut and the Turkwel are the Suk Mountains, a tumbled mass of strangely-shaped peaks and ridges, well-watered, and having excellent grazing. These mountains are a northward extension of Elgeyo, and form here the western boundary of the Rift Valley. The Kerut river skirts their eastern slopes from which numerous small streams descend. The country is finely timbered and cultivated. North of Seker the Kerut is fringed with a belt of dense forest as far as its junction with the Turkwel.

The other permanent stream which traverses the Suk Plains is the Kerio. It issues from the narrow valley between Elgeyo and Kamasia, and flows first north and then NNE. Parallel with it to the east are the Taiti Hills, the northern extension of Kamasia. It is deep and difficult to cross.

Between the Kerio to the east and the Kerut to the west is a bush-covered plain, sloping gently to the north.

The northern termination of Mount Masol, a long isolated hill rising from the plain marks the boundary between the Suk and Turkana countries. On the Kerut river Seker is the most northerly settlement of the Suks.

The Turkana country extends northward into the Sudan, the greater part of it being in Uganda. It is a plain of low altitude, broken at intervals by ranges of hills and isolated heights. That portion of it which lies in British East Africa east and south of the Turkwel river is almost entirely covered with dense thorn bush. The Turkana are a nomadic people, owning large herds of cattle, sheep, goats, camels, and donkeys, in spite of the scanty rainfall, and the scarce pasturage in the dry season. Grain cultivation, except near the Turkwel

river, is almost unknown. (For a full description of the Turkana country, see *Uganda Handbook*.)

Immediately to the north of Mount Masol, which, as stated above, marks the southern limit of the Turkana, is Mount Laterok (6,470 ft.). About midway between it and the Kerio river to the east, at a place called Akuilo, are permanent hot springs. West of Mount Laterok, between it and the Kerut river, is the Lebatui Plain, a Turkana grazing ground, where the country begins to fall in a rapid descent towards Lake Rudolf (see 'Rift Valley'). North-east of Mount Laterok is Mount Kalongol, said to have permanent water on its summit. From Mount Kalongol the line of isolated height continues for a considerable distance in a NNW. direction, gradually approaching the Turkwel river.

North of its junction with the Kerut, the Turkwel is a splendid stream, its bed varying in breadth from 500 to 600 yds. Along its banks, on either side, is a belt of forest, tall acacia trees, with thick undergrowth. Outside this strip the country is dry, arid, and bush covered. Northwards the river steadily diminishes in width. Sixty miles north of its confluence with the Kerut it makes a great bend to the east. As it approaches Lake Rudolf it gradually widens again, but when within 3 or 4 miles of the lake's western shore, again diminishes, and eventually becomes lost on a sandy stretch about half a mile from the lake. It is only after rain, and then only for a day or two that its waters enter Lake Rudolf above ground.

JUBALAND AND THE NORTH FRONTIER PROVINCE

There remains to be described the northern half of British East Africa. As previously stated, a line drawn from the southern end of Lake Rudolf to Lamu may be taken as roughly indicating the division between the two parts of the Protectorate. The country to the north and east of this line is in striking contrast to that just treated, being almost entirely desert, for the most part economically useless, and monotonous in scenery, with few outstanding natural features.

It is divided into two provinces, Jubaland to the east and along the coast, and the North Frontier province to the west. The boundary between them runs from Unsi on the Daua to the Lorian Swamp, passing to the east of Eil Wak, and through the district of Wajheir. From the Lorian Swamp it runs in a straight line south-east to Dicks Head (Ras Kiamboni) on the coast. In Jubaland the country consists of a series of broad valleys, so shallow as to be hardly perceptible, and overgrown for the most part with dense bush. A low ridge of hills runs north-east and south-west between Gobwen and Yonti on the Juba, and there is a line of sand-hills about 200 ft. in height running parallel with the coast between Gobwein and Port Durnford. Behind these hills the land stretches away north and west in a great expanse of thick clinging thorn scrub, without one single object to break the monotony of the scene. At intervals in this wilderness there are open spaces and park-like glades, though of no great area. These are more numerous towards the coast in the country north of Port Durnford and west of Kismayu. In many of them, especially in the district of Joreh or Chore, the soil is fertile and the vegetation luxuriant.

The only permanent streams in Jubaland are the two frontier rivers, the Juba and the Daua, and two small streams which enter Arnoleh Creek. In the Marehan country, north-eastern Jubaland, permanent water is found at several places, but the supply is small. In the rest of the province there are no permanent water holes, except the wells at Wajheir, Eil Wak, Afmadu, Fungal, and Kaurao. The last named is 16 miles west of Serenli. In the Wajheir district, which lies on the caravan route from Kismayu to Abyssinia, there are several hundred wells of clean and clear water, but there is no more water for 70 miles in any direction. The wells of Fungal and Afmadu on the Lak Dera are about 180 miles south-east of Wajheir, and there is no water all the way. At Eil Wak, 118 miles to the north-east of Wajheir, there is a collection of about a hundred wells, spread over an area of 8 square miles. The supply of water is unlimited, but very salt and nasty.

There is, however, a considerable amount of what may be called semi-permanent water in south-western Jubaland. Here there is a plateau of slight elevation from which in the rainy season water flows into a series of swamps which are drained by two creeks entering the sea at Port Durnford. The district of Joreh contains some flat-topped hills on which a fairly plentiful quantity of rain falls, and it possesses in consequence valuable grazing grounds. The Guranlegga or Lak Guran hardly ever dries up, and though in the dry season there is no running water, large pools are left in the river-bed. This river rises in the Kurde district, to the north of Joreh, and flows eastwards, but disappears before it reaches the sea. Besides the Lak Guran there are pools and water-holes, such as the Gulola and Gama Gar Swamps, which fail only in the driest seasons. At Jara, in the Kurde district, water can always be obtained by digging to the depth of 3 to 9 ft., which seems to indicate that a copious supply exists underground.

The Guaso Nyiro, which should flow through Jubaland, is lost in the Lorian Swamp, an enormous bed of dark green reeds, 60 or 70 miles in circumference in the wet season, and dotted with deep pools. In the dry season it is a mud flat with permanent water in the middle. About 50 miles to the west of this swamp there rises precipitously from the bush the remarkable volcanic plateau of Marti. It is some 20 miles in length from east to west, by 5 miles broad, its greatest elevation being 1,607 ft. above sea level, and 603 ft. above the surrounding country, with a broad level summit, on account of which the Swahili call it Kilima Ya Mesa or Table Mountain. It is also known under three other names—Erimba, Sirra, and Marisi. The Guaso Nyiro flows towards it from the south-west, turns east, closely following its base, and then having left it behind, north-east. The river passes this plateau; a fine stream just under 200 yds. broad. From that point it rapidly dwindles, becoming shallower and narrower, and when it enters the Lorian Swamp it is only 10 yds. across and 2 ft. deep. It continues through the swamp and emerges

still more diminished, being now only 6 yds. broad and 12 in. deep. Six miles farther on it encounters another swamp, known as Melka Waja. Once more it emerges in a still further attenuated form and flows eastwards for 11 miles until permanent water ceases in a series of pools at Madoleh (Madelì).

The course of the river is, however, continued eastwards by a well-defined dry river-bed known as the Lak Dera, which connects the Lorian Swamp with Deshek Wama. It varies in breadth from 10 to 300 yds., and is much overgrown with bush and jungle. From Madoleh, until the district of Afmadu is reached, the country through which it passes is quite flat on each side, and for the most part arid in the extreme and covered with dense thorn. The natives have named the country on its southern bank Rama Gadi or the bush wilderness. There is a small belt of fertile alluvial land along the Lak Aboloni, a dry water-course which joins the Lak Dera from the south-west about 70 miles east of Madoleh. At Fungal, in the Afmadu district, some 60 miles farther east, there are wells, and the grazing is quite good, the water being near the surface. Not far from this place the Lak Dera is joined from the north-west by the Lak Jera river-bed, which has water running in it during the rains. The united river-beds bend south-east past Afmadu. There are 114 wells in the bed of the Lak Dera at Afmadu, all but one of which are now disused. The country round is a plain of open park-like spaces, interspersed with bush. Forty miles to the south-east of Afmadu the Lak Dera ends in the Deshek Wama. This is a huge lake, now connected with the Juba from which it had been cut off by an artificial bank, but the water has since broken in elsewhere. It is 16 miles long by 12 broad.

The river Juba is formed by the junction of the Daua and Ganale at Dolo, and thence to the sea receives no tributaries though several small streams temporarily discharge their waters into it during the rains. It flows south-east to Lugh and then in a general southerly direction, its course being

exceedingly tortuous, and in places doubling back upon itself. As far as Serenli, the British frontier post, opposite the Italian town of Bardera, the river-bed falls rapidly in level. About 20 miles above Serenli the river descends over a ledge of rocks and a little below this are the La Hele rapids. Here the river runs through rocky hills which rise 300 to 400 ft. above it. The La Hele rapids mark at present the limit of navigation up the river, but they are not an insuperable obstacle. From Serenli onwards the valley of the Juba becomes remarkably level, having a fall of only 500 ft. in the 300 miles which separate that station from the sea in a straight line. If the channel of the river were followed the distance would be double owing to its extraordinary windings. From Serenli to Anola the banks are bare and stony, with a plateau 200 ft. above the stream, extending on either side of it. At Anola the banks become fringed with forest, varying in width from a narrow strip to 8 miles. At Mfudu, about 100 miles below, the river forks, forming a large island 24 miles long. The forest from this point onwards ceases to follow the banks, and is separated from the river by alluvial flats from 1 to 5 miles in breadth. This alluvial belt along the western bank is very fertile and is stated to be equal to the best lands in Egypt. The forest fringe, which is sometimes 5 miles in depth, shelters it from the desert. At Yonti, which is 14 miles from the mouth, the scenery changes, and the country consists of large grassy plains with occasional woods.

From the fertile strip along the Juba the desert rises with a continuous gentle slope to the north-west, finally reaching an elevation of about 2,600 ft. in the unhealthy Golbo Plain, which lies at the foot of the Goro or Boran escarpment, 370 miles from the coast. This escarpment marks the boundary of the high lying and fertile grass lands of southern Abyssinia. From Gara Gandad the line of the escarpment runs south-west to Gaddaduma, which is across the frontier in Abyssinia. Here it turns west, and so continues for some 70 miles to Uran, where it bends away beyond the frontier to the north-

west. It rises about 1,500 ft. above the plain, with wooded slopes, intersected with long nullahs, and there are numerous projecting spurs. Some miles west of Gaddaduma the fine peak of Gara Roka juts out into the plain from the face of the escarpment, its summit being crossed by the frontier line. Twenty-five miles west of this is another great spur, Gara Topeisa, close to the north end of which is the frontier post of Moyale or Fort Hannington. Moyale Post is situated on a ridge at an altitude of 4,200 ft. Behind it, across an intervening valley, the ground rises to the Abyssinian highlands. Churre Moyale is about $1\frac{1}{4}$ miles to the north. In between is Dumbi Moyale, a sacred place of the Boran tribe. West and south-west of Moyale many isolated hills rise from the plain such as the great rock of Turbi, which rises straight out of the desert to a height of 300 ft. above it. Nearly 40 miles west of the point where the Boran escarpment bends away to the north-west are the Huri Hills, which culminate on the frontier in the height of Gara Furroli, and strike south-west from there for 70 miles. They attain an altitude of 5,000 ft. and consist of open rolling downs surmounted by a row of conical peaks. These hills are waterless except in the rains.

Soon after passing to the west of the track which leads from Wajheir Wells to Wajheir Moyale the ground begins to be strewn with blocks of lava. Farther west again there is a succession of low plateaux, bounded by abrupt lava scarps. Occasionally, after exceptional rains, this wilderness is covered for a short time with grass and flowers, but its normal condition is one of complete desolation.

In the centre of this desert is the mountainous district of Marsabit, reaching an elevation of 5,000 ft. above sea-level and 3,000 ft. above the plain. The Rendile call it Haldaiyan and the Boran Saku. It is some 30 miles across from east to west, and about the same distance from north to south, forming a beautiful oasis in the desert. The water-supply, from numerous springs, is clean and plentiful, the soil exceedingly fertile and the grazing good. Above the level of 4,300 ft.

it is covered with fine forest. There are many extinct craters and conical hills, the whole dominated by three peaks. In the main crater there is a lake lying in the heart of a forest of magnificent straight lofty trees. In shape it is almost a complete circle one and a half miles in circumference. The altitude of the lake is 4,700 ft., and the crater wall attains to a height of 300 ft. above it. The only practicable approach to the water is on the southern side where the crater wall falls away to 30 ft. above the lake level. Four or five miles farther on, to the north through the forest, is another crater-lake, smaller in size and covered with papyrus. A little to the south of the main crater is the crater of Lonkerø, remarkable for its size and depth, with almost perpendicular walls. Opposite Lonkerø to the north is the curious-looking conical hill of Ol Donyo Guas, the whole of one side from base to summit being grass, while the other side is forest. On the southern and western slopes of Marsabit, outside the forest area, are several dry craters, of which the most striking is one near the caravan route to the north. This forms a splendid amphitheatre, 500 or 600 ft. below the ground-level and nearly a mile across.

Except in the very dry season the forest of Marsabit is wrapped in mist until 11 o'clock in the morning. The climate is unhealthy and damp, and the place has been abandoned as the administrative post of the Northern Province.

North of Marsabit is the lava-strewn desert of Dido Gulullo. Delamere's Pool, which is four hours from Marsabit, is the last water for 120 miles. The water is swarming with leeches, and must be strained. To the south 47 waterless miles, across the desert of Kasut, separate Marsabit from Lasamis, a desolate and unhealthy spot with a few brackish pools, marking the end of a line of water holes which extend south from here to Archer's Post on the Guaso Nyiro, a distance of 78 miles. Seven miles north-west of Lasamis is the conspicuous and lofty obelisk of Lodermut, while to the south-west is the solid granite mass of Moille, surmounted by a sharp rugged peak. Fourteen miles

south of Lasamis is Merille on a khor, which runs almost due east and west, bounded on both banks by dom palms. Water can be obtained almost anywhere in this khor by digging 2 or 3 ft. below the surface of the sand. At Kauro, about 30 miles from Archer's Post, is a dry khor lined with palms. Water can be found here by digging in spots known to the natives. Between Kauro and the Guaso Nyiro there are many palms, showing the existence of water not far below the surface. From Marsabit southwards the country rises all the way to within 12 miles of the Guaso Nyiro, when it slopes down to the northern bank of the river.

About 25 miles to the west of Marsabit is a remarkable lava scarp. It runs roughly north and south, with wide bays and promontories, from Balessa, to the west of the Huri hills, to the Arsim watercourse, south-west of Marsabit. There is a sheer drop to the west of about 200 ft., and underneath it, from north to south, are the oases of Kalacha, Kerauwi, Maidahad, Karoli, and Laipera. It is not improbable that a plentiful supply of water exists here. The desert to the west of Marsabit, which is crossed by this lava scarp, is known as the Elges, and is a lava-strewn wilderness extending to the mountains of Ol Donyo Mara and Kulal at the south-east end of Lake Rudolf. An interesting feature of this region is the great Balessa watercourse which, starting in the valley of Orr between Ol Donyo Mara and Nyiro, skirts round the eastern slope of Mount Kulal and holds on its course till near Lake Stephanie.

CHAPTER II

GEOLOGY

Coastal Belt—The Gneiss Area (Nyika and Eastern Highlands)—The Volcanic Region (Highlands and Rift Valley)—The Lake Zone.

ARCHAEAN gneiss forms the foundation platform of British East Africa. Along the coast there is a belt of sedimentary rocks, and throughout the whole central part of the Protectorate, including the Highlands and the Rift Valley, the gneiss is covered by a huge lava cap. This lava area extends north into Abyssinia and south into Tanganyika Territory.

Those parts of the Protectorate which are better known geologically can be divided broadly into four sections :

1. The Coastal Belt formed of sedimentary rocks.
2. A broad region of gneiss stretching from the margin of the coastal belt to the Highlands.
3. The volcanic area of the Highlands.
4. The districts of North and South Kavirondo and the shores of the Victoria Nyanza, where gneiss reappears again, and there is much granite, with areas of sedimentary and volcanic rocks.

The various beds are well exposed in the cuttings of the Uganda Railway, and there is in consequence more detailed knowledge of the geological structure of the country along the line of the railway than anywhere else.

THE COASTAL BELT

1. *The Coastal Belt*, consisting of sedimentary rocks, extends inland as far as mile 57 on the Uganda Railway. These rocks consist of three chief groups : (i) raised coral formation ; (ii) shales of upper Jurassic age ; (iii) a thick series of grits and sandstones with subordinate shales, called the Duruma

sandstones. These formations correspond almost exactly with the coast plain, the foot plateau, and the Nyika, rising one above the other into the interior. The beds dip gently towards the coast, and going inland older and older beds are encountered.

The east coast of Africa is one of the great coral belts of the world. From Somaliland to Delagoa Bay, a distance of 2,000 miles, the prevailing formation is coral. The rocks of the coast and coast plain of British East Africa are a fringing coral reef, formed when the sea level stood some 60 or 70 ft. higher relatively to the land. At Mombasa there are coral reefs 70 ft. above sea level. At the entrance to Kilindini Harbour there is a second cliff 200 ft. back from the edge of the present coral cliff, which must have marked the width of the channel in Pleistocene times. Below this present cliff another is just beginning to emerge from low-water level. Outside the existing shore line, all along the coast, fringing and barrier reefs are forming in great numbers, generally parallel to the coast. A slight elevation would extend the shore line eastwards for some miles.

The present harbours of Mombasa mark gaps in the reef opposite the Mwachi and Mwamba rivers. The discharge of fresh waters prevents the formation of coral reef: consequently when the new inland cliff at Kilindini marked the boundary of the tidal channel more fresh water must have been coming down than at present. The same fact accounts for the caves in the coral rock at Shimoni. These caves contain fresh-water springs, and the coral insect has built over them, leaving the galleries which now exist in the reef. The deep harbours of Kilindini and Mombasa are drowned valleys. After the formation of the raised reef an elevation of the land took place, followed later by subsidence. During the emergence of the land there was considerable denudation, pre-existing valleys being deeply cut down and new ones eroded. This denudation was brought to an end by the return of the sea to its present position. It was then that Mombasa Island became separated from the mainland. The sea invaded and

drowned the valleys now represented by Kilindini and Mombasa harbours. During the previous period of uplift two tributary streams had cut their valleys back until separated only by a low col, which is now the site of the shallow Makupa channel.

From Lamu to the southern frontier there stretches a low-lying flat coast plain varying from 2 to 10 miles in breadth. It is largely a plain of marine denudation, and is underlain for the most part by coral rock. This rock is covered with a red soil of wind-borne quartzose sand, which settles in the pockets of the coral and produces luxuriant vegetation. Mombasa Island is composed partly of coral limestone, and partly of a very coarse clean sand, often cemented by calcite into sandstone. To this latter the name of 'Kilindini Sands' has been given. As both these rocks are porous, water does not stand after the rains, except in certain parts of the native town, an important factor in the health condition of the island. The limestone in the southern part of the island is commonly close to the surface or covered by limestone rubble, and a few feet of reddish brown clay loam. The soil overlying the 'Kilindini Sands' is a light brown sandy loam, often several feet thick.

Almost immediately behind Mombasa Island a foot plateau rises with some abruptness to a height of 200 ft. The slope is the old sea cliff of the raised reef period. The peninsula between Port Tudor and Port Reitz is formed of a thick uniform series of dull olive-green friable shales, slightly sandy and micaceous, and containing nodules of clay, ironstone, and argillaceous limestone. The latter would yield hydraulic lime, but are nowhere found in sufficient quantities to be worth collecting for calcination.

These Jurassic shales have an outcrop 7 miles broad, and overlies the Duruma Sandstone series. They occupy only a limited area, their southernmost exposure being near Tiwi, while to the north they cease in the neighbourhood of Takaungu.

Round Changamwe, behind Mombasa Island, the shales are overlain by a deep orange loam, 6 to 8 ft. deep. This is a fertile

district and the shales are nowhere seen at the surface. At mile 9 on the railway the loam ceases abruptly, and the shales appear. Here cultivation becomes impossible, and the only vegetation consists of coarse grass and small thorn-trees.

The Jurassic shales are soft and easily weathered and dissected. In places they have been entirely removed, or left as a series of low rounded hills, such as the three to the north of Freretown known as the Crown of Mombasa. The country is cut up by numerous deep ravines, streamless except in the rains. Their rock floors in many cases pass beneath low-water mark, and the lower reaches are sometimes occupied with arms of the sea, sometimes filled with alluvium. West of the shales comes the outcrop of Duruma Sandstones, which compose the Shimba and Giriama hills. Where crossed by the railway they occupy an area of 45 miles in breadth. The transition from the shales to the sandstone is marked by a relatively steep escarpment, erosion having removed the softer shales and left the harder sandstone outstanding.

The Duruma Sandstone series is divided into four lithological groups. The first bed, known as the Mazeras Sandstone, is coarse-grained, massive, and reddish in colour. It forms the rock of the Shimba Hills, and is exposed in the horse-shoe gorge of the river Mwachi, where it includes a bed of greyish pisolitic limestone about 30 ft. thick.

The second bed consists of the so-called Mariakani Sandstone, fine grained and yellow in colour. It extends along the railway from Mazeras station for 13 miles.

The third or Mazi-ya-Chumvi bed consists of repeated alternations of dull greenish mudstones with compact hard sandstone, the former predominating. A bore put down through this bed near Samburu passed through black and micaceous shales with obscure traces of plant remains. Several sandstones were also found to contain black carbonaceous specks. They appear to be continuous with the sandstones in the valley of the Sabaki, where fossils have been discovered giving definite evidence of carboniferous age. Workable coal seams have been found in beds of this age in India and South Africa.

The fourth bed is known as the Taru Grits, and extends along the railway to mile 57, where the gneiss begins. It is a massive current-bedded felspathic grit, composed of grains of very unequal size. The grains are closely packed together, and this cementation has proceeded to a depth of 450 ft., which greatly diminishes the porosity of the rock.

The Taru Hills, 9 miles west of Samburu, consist of coarse and fine sandstone, containing feldspar and black and white mica, with small quantities of graphite and garnet.

The soil covering the Taru Grits is coarse and sandy, of a brown or grey colour. On approaching the edge of the Taru Desert, a few miles beyond Samburu, the colour of the soil changes to bright red, characteristic of the gneiss region. The change occurs first on the ridges, where the soil is drier, while in the hollows the brown colour continues.

Between Mwele Hill, the southern termination of the Shimba Hills and the southern frontier, the geology is somewhat different. When the coral ceases, instead of shales cropping out, deep white alluvial sand covers everything, and there are large flat stretches of savannah-like country. This gives place to gently rolling country in which the older beds appear, but the coarse barren sandstones are missing, their southernmost exposure being Mwele Hill.

A small but interesting volcanic series occurs here, standing out in the three summits of Jombo, Mrima, and Kiruko. Jombo is a massif of nepheline syenite. Six miles north-east of its summit is a hot spring, of which the contained salt is chiefly sodium chloride. Mrima consists of deep red earth, with blocks of vesicular lava and micaceous sandstone. These volcanic rocks are intrusive into the sandstone and of later date. A number of dykes, evidently contemporaneous with these centres of disturbance, intersect and traverse the sedimentary rocks.

The limit of the coastal belt in this southern part lies a little to the west of the isolated gneiss hill of Kilibasi, which protrudes through the sandstone, and is the most easterly representation of the metamorphic rocks. To the south and east

of the hill is a large area of black cotton soil, while to the west is bright red sand.

As already stated the coast plain extends from Lamu to the southern frontier. North of Lamu, in the province of Jubaland, there is no intervening strip of fertile plain, and the Nyika comes right down to the coast. The general slope of Jubaland is from north-east to south-west, the country consisting of broad and very shallow valleys. Near the sea these disappear, and give place to a level arid plain, which is only separated from the sea by a line of sandhills. From Kismayu to El Las, a distance of 300 miles, there are no hills of any sort. The aspect of the country resembles that of an old sea-bottom, and there seems no doubt that the whole of this area, 80,000 square miles of bush-covered plain, was once covered by the sea. Coral rock and marine deposits of recent age extend inland as far as the Abyssinian frontier, 370 miles from the coast. At Eil Wak (Wells of God) the water is found underground in a kind of light bluish clay, and in the neighbourhood there is coral limestone, gypsum, and other deposits. In the Wajheir district the wells are cut straight down through limestone rock as symmetrically as if cut with a drill. One theory is that they are geysers. The water in them is almost lukewarm. In the bush small blow-holes have been discovered, while all round are piles of igneous rock, probably the result of explosions. The wells at Eil Tuli, which, as the name implies, are strongly impregnated with sulphur, are sunk in a grey sandstone bed which runs almost due north and south. At Siddeh Dima the wells go down through a soft kind of gypsum rock to a depth of 20 ft.

The soil of Jubaland is for the most part a firm red earth. In the north the ground is covered with stones, mostly quartz. Along the Juba river there is rich alluvial land.

THE GNEISS AREA (NYIKA AND EASTERN HIGHLANDS)

2. The second section, into which the Protectorate was divided for geological consideration, is that occupied by Archaean Gneiss, and includes the greater part of the eastern

half of the country. On the Uganda Railway it begins at mile 57, and it is not till mile 283 that the gneiss passes beneath the lava of the Kapiti Plains. This Archaean gneiss forms the platform on which all the sedimentary and volcanic rocks are laid down, and is the foundation of the entire African continent.

The gneiss is coarse grained and well foliated and exhibits remarkable uniformity of structure. The chief constituents are quartz, felspar, hornblende, and biotite. It is traversed with veins of coarsely crystalline pegmatite, composed principally of quartz and felspar. Mica is sometimes present, usually in small quantities, but in places there are considerable deposits.

The gneiss forms bold hill ranges and isolated heights. There is no granite south of the Guaso Nyiro, nor any igneous rock intruded into the gneiss. In local areas there are lava flows from fissures and mound-like volcanoes.

The plateau occupied by the gneiss slopes up from 1,100 ft. on its eastern border to a height of 5,300 ft. on the edge of the Kapiti Plains to the west, the gradient becoming considerably steeper to the north of the Tsavo river. The former gneiss plateau must have reached its greatest height at the present Rift Valley. Remnants of gneiss are found on the highlands between 8,000 and 10,000 ft. above sea-level.

The eastern border of the gneiss belt is nyika or arid desert, like the region immediately preceding it to the west. It is level, monotonous, and of small relief, with broad, shallow, flat-floored valleys and ravines. It differs, however, from that part of the nyika underlain by the sedimentary rocks in two striking features, first in its bright red soil, and secondly in the monadknocks or isolated heights which are specially characteristic of the arid or semi-arid gneissic area.

The bright red sandy earth is formed by the disintegration and decomposition of the gneiss. Felspar, augite, and hornblende are the constituents of the gneiss which decompose most readily and form a clay stained bright red with ferric oxide. The climate in the gneiss area is more arid, and produces partial or complete dehydration of the iron oxides.

The other constituents of the gneiss, quartz, magnetite, and garnet, are broken up and mixed with the red clay, which is distinctly gritty. The natural fertility of this soil is very great, and under suitable irrigation it would become exceedingly productive. A bore put down at Mackinnon Road station proved to be 63 ft. in depth. Kunkar is found in the red earth at the depth of a few feet, usually at the lower end of the slopes of the numerous hollows which extend north and south across the Taru Desert. On calcination the kunkar yields a lime which is suitable for ordinary building purposes. There are few minerals of any economic value, and those occur only in small quantities and poor condition.

Black cotton soil is found in the gneissic belt on ground which is poorly under-drained on account of the impervious rock floor, as to the south and east of Kilibasi, at Makindu, and Sultan Hamud. It also forms terraces along the banks of streams, as on the Voi. In the wet season it is more or less waterlogged.

Monadknocks or isolated hills form the chief feature in the scenery along the railway from Maungu to Kiu. They are the denuded remnants of what was once an entirely mountainous region. In general these gneiss residuals are ridges which lie parallel to the foliation of the gneiss. Those of high altitude are deeply eroded, their sides gashed with ravines which reach from summit to base. In the neighbourhood of Kiu they are especially numerous and close together. Maungu, the first of these isolated hills along the railway, is composed of gneiss with quartz, felspar, and black mica. The last occurs in bands, so that the whole rock takes on a banded structure. The isolated height of Kisigau, Rukinga, Pika Pika, and Kilibasi, lie to the south of the railway. Others of a similar nature rise on the eastern side of Lake Jipe, and to the south and east of Taveta.

Besides these isolated hills there are a series of gneiss mountain ridges, usually trending NNW. and SSE., a direction parallel to the foliation of the gneiss. They vary in altitude from 5,000 to 7,000 ft., and rise about 2,000 to 3,000 ft. above

the normal level of the country. These ranges are the crests of ancient earthfolds, and great thrust faults are nearly always traceable on either the east or west side. Professor Gregory describes them as being part of the 'primitive axis' or backbone of the continent, once continuous from the Drakensberg in Natal to the Shoho mountains in Abyssinia. In the course of ages they have been greatly denuded, and have been breached by all the principal rivers, so that they now form intermittent ranges with great areas of flat country between them. In places they have been buried under vast volcanic piles. The continual recurrence of steep bare hogs-back hills of gneiss, the remarkable persistence of north and south foliation, and the character of the rocks show that they are part of a common chain.

In the Bura Hills and the Ndi and Ndara Hills round Voi, the gneiss is well bedded. The bedding planes have a constant dip almost due north. Water sinks through the gneiss rock and issues in springs along the bedding planes. As a result these hills are fertile and well watered.

The rocks of the Bura Hills are intercalated with thick strata of crystalline limestone. A white or pale bluish crystalline marble is exposed along the Taveta road, $2\frac{1}{2}$ miles south of the railway, and again between Bura and Taveta, and also north of Tsavo station. There is another large outcrop to the south of Kenani station. It is too coarse in grain to have any value as an ornamental stone. The hill of Bwinzau to the north of Kibwezi is of pink gneiss with many coarse pegmatite veins. Limestone occurs in the neighbourhood and along the Athi river. The gneissose and schistose hills of the Machakos district form a series of concentric ridges round a central area of elevation, an arrangement which is now obscured by faultings along the west. Valuable deposits of mica exist in these hills.

The northern termination of the Machakos Hills is the great height of Ol Donyo Sabuk, round which the Athi makes its great bend. A ridge of gneiss, crossing the river at right angles to its course, forms the Athi falls. At this point the Athi is

separated from the Thika to the north by a remarkably narrow and hardly perceptible divide, where the gneiss is overlain by volcanic rock. The gneiss appears at the surface again in the elbow bend of the Thika, and forms the Ithanga range. From here to Fort Hall there are many small areas of gneiss, representing the tops of buried hills, now being laid bare by the denudation of the volcanic rocks. Similar patches occur also to the north of Fort Hall in the direction of Nyeri. Nowhere is it better illustrated than here that the volcanic rocks have been erupted on an irregular land surface of gneiss, similar to the hilly country which it forms to-day.

The mountains of the Kitui District resemble in character and composition those of the Machakos District. They form a line of gneiss mountains running north and south of the station of Kitui, and terminating to the north in the Mumoni Mountains round which the Tana river bends to the east. The Grand Falls, which occur on the Tana at this point, are caused by a ridge of gneiss crossing the river, and are among a succession of similar falls between its junction with the Thika to the south of Mount Kenya, and Hameye on the edge of the nyika.

Not far from a place called Kibui, about midway between Kitui and the Mumoni Mountains, there is a small hill composed entirely of limestone, containing every gradation of the rock from pure white crystalline limestone to a garnet pyroxene.

To the north of the Guaso Nyiro isolated gneiss hills appear again, rising steeply from a bare plain, and often weathered to the most fantastic shapes. In this northern region there are also granite hills, such as the solid granite mass of Moille, and the great obelisk of Lodermut, the former to the south-west, the latter to the north-west of Lasamis.

Recent lava-flows cover the gneiss in local areas. Of these the most striking is the long low lava-capped plateau of Yatta-Ndungu, which rises up immediately on the left bank of the river Athi, and separates the gneiss hills round Machakos from those of the Kitui District. It strikes north-west and south-east, and continues to beyond the junction of the Athi

and Tsavo rivers, with a total length of about 170 miles, while in places it is not more than 3 miles broad. The lava of which it is composed is a nepheline phonolite, and must have been erupted from a fissure parallel to its length. The sharp rectangular features of the plateau are in striking contrast to the irregularly curved outline of the gneissic hills. To the north-west it seems to be continuous with the bend of the Athi round Ol Donyo Sabuk, and thus forms the remarkably narrow divide between the Thika and Athi rivers to which reference has already been made.

Opposite the Yatta Plateau, across the intervening plain to the west, is the range of the Kyulu Mountains, also striking north-west and south-east. The rock is partly gneiss, but mainly lava of a typical olivine basalt. At the foot of the hills the lavas show excellent flow structure with ropy surfaces. In the neighbourhood of Mtito Andei, at mile 160 on the railway, midway between Yatta and the Kyulu Range, gneiss, basic lava, and limestone occur, so that it is possible to secure any desired kind of soil.

Round Kibwezi, between mile 193 and 198 on the railway, the gneiss is overlain by olivine basalt lava of no great thickness. The surface is very irregular and covered with forest. At Kibwezi a stream issues from the base of the lava.

At Simba and Sultan Hamud thin lava-flows from small volcanoes cover the country to quite an extent. The higher hills in the neighbourhood are composed of gneiss rising out of the lava plain, with the exception of the Mwani hills to the north of Sultan Hamud station which are olivine basalt.

VOLCANIC REGION.—HIGHLANDS AND RIFT VALLEY

3. The *Volcanic Region* comprises the central and much of the western part of the Protectorate. Measured directly from the eastern limit of the Kapiti Plains to the Victoria Nyanza, it has a breadth of 180 miles. South of latitude 1° north, or roughly the line of the Guaso Nyiro, volcanic rocks cover an area in British East Africa of 24,000 square miles.

North of the Guaso Nyiro, in the North Frontier Province, they extend eastwards along the river to the Marti plateau, about 40 miles from the Lorian swamp, and farther north again, to almost as far as the track from Wajheir to Moyale on the Abyssinian border. From this lava area rise the huge volcanic piles of Kenya, Elgon, and Kilimanjaro, and the Aberdare range.

The present topography of the Highland Region is due to a complex series of eruptions and earth movements along a line of weakness which runs from the Red Sea through Kenya and Kilimanjaro to the basin of the Zambezi. The volcanic rocks have been erupted over an irregular surface of gneiss which it covers, to varying depths. Though a vast interval of time must have elapsed between the formation of the gneiss and the earliest volcanic eruptions, there is no evidence of any other formation between in the region east of the Rift Valley. This holds good for the most part of the country west of the Rift Valley, but here in Nandi and North Kavirondo there are exceptions which will be dealt with later.

Two types of volcanic activity are apparent, a series of fissure and plateau eruptions producing a succession of lava flows, and another series producing cones with craters. Professor Gregory traces three of the former type, and two of the latter, starting with a plateau and fissure eruption in the Cretaceous age and followed, in the Eocene age, by a period of crater eruptions, producing the older craters of Kenya, Satima, and the Mawenzi crater of Kilimanjaro. The Rift Valley subsided slowly over a vast interval of time from the Eocene and Pleistocene ages. Though it cannot be assumed that volcanic activity was dormant during the earth movements which formed the valley, it is clear that the subsidence was followed by another outbreak which produced the valley cones such as Longonot, and also apparently Elgon and the Kibo crater of Kilimanjaro.

Fissure eruptions are produced by the liquid magma welling up through fissures without any formation of craters. The best instance of this is the Yatta Plateau already described.

Plateau eruptions form great lava-covered plains, such as those of Kapiti and Athi. These lava plains are always found on high plateaux. If such a plateau occurs over a great subterranean lava reservoir, the rocks will be subjected to tension in all directions. Instead of one big vent, there will be numerous scattered small ones, the flows from which will coalesce into continuous sheets of lava.

The Rift Valley divides the volcanic region into two parts, eastern and western. Both are built up of a succession of lava flows and volcanic tuffs which dip in each case with the slope of the surface. The angle of average dip, however, is less than the average slope of the surface, so that coming up from the east or west to the edge of the Rift Valley, newer and newer rocks are encountered.

The eastern portion of the volcanic belt is about 60 miles in width, and includes the country lying between the gneiss area and the Rift Valley. It consists of a succession of lava-covered plateaux. These, from south to north, are the Kapiti and Athi Plains, the Kikuyu Plateau, the Nyeri Plains, and the Laikipia Plateau. Each has marked characteristics of its own.

The Kapiti and Athi Plains are composed of sheets of old lava flows, caused by plateau eruption. The rock is phonolite, the most widely distributed type of lava in the volcanic area. The lava sheet, which at Nairobi is at least 100 ft. thick, becomes very thin towards the south of the Kapiti Plains, where they are crossed by the Magadi railway. The junction between the phonolites and the gneiss is apparent in any of the valleys. In the Turoka gorge the lava appears as a thin layer covering an uneven surface of gneiss. Between Ulu and Turoka stations a group of altered sediments has been traced over an area of about 100 square miles. A large number of rock types are found, varying from one purely arenaceous, which forms the locally conspicuous hills, to beds of marble of considerable thickness. The Busimoro hills, on the frontier, are built of metamorphosed sediments largely arenaceous.

The Kikuyu Plateau has a marked slope from north-west to south-east, caused by the subsidence of the country to the south, now the Athi Plains, while the Laikipia Plateau to the north remained firm. The rainfall being heavy, the rocks easily denuded and very variable in hardness, the streams have cut a series of deep and sinuous gorges. Kikuyu is thus a trenched and denuded plateau, consisting of a continuous sequence of ridge and valley.

Within the area of the township of Nairobi four distinct beds of rock crop out. The lowest is a nearly black porphyritic phonolite. This occurs on the low ground which is part of the Athi Plains. Overlying this is a pale grey soft porous claystone, largely used as building stone, on account of the ease with which it can be quarried and dressed. It is apparently a lava which has undergone a process of alteration. Above the claystone is a bed of volcanic agglomerate which reaches a total thickness of 40 to 50 ft. Finally above the agglomerate is a thick bed of trachyte, which forms Nairobi hill. This trachyte continues west of Nairobi as far as Kijabe. It is a lava, composed mainly of potash felspar, greenish in colour, and prickly to the touch.

The beds which underlie Nairobi also underlie the country northwards along the road to Kiambu. At the Kamiti river the road to Fort Hall passes on to a hard bed of streaky rhyolite, which continues to the north of the Chania river, and forms the sill of the Ruiru and Chania Falls. Rhyolite in its natural outcrops weathers well and forms prominent features, such as the line of crags on the south side of the Mathioya valley, immediately to the west of Fort Hall. It is used for building purposes by the Public Works Department. Between Fort Hall and Nyeri the sill of the large waterfall on the Kagoma river is an olivine basalt having a good hexagonal columnar jointings. At Nyeri the stone used in the construction of the station is a dull green tuff containing fragments of pumice, rhyolite, and basalt.

The volcanic rocks underlying the Nyeri Plains are all olivine basalt.

The Laikipia Plateau is composed of sheets of lava, chiefly basalt and phonolite. It is roughly oval in shape, and is bounded to the north by the gneiss range of Loroghi. Here and there on the plains are small conical volcanic hills, usually basalt and andesite. Sirima Hill which rises to the east of the track between Nyeri and Rumuruti, immediately north of the equator, is the denuded stump of a small volcano, and consists of agglomerate and basic lava.

Mount Kenya, which is buttressed up against the eastern edge of the Nyeri Plains and occupies the enormous area of 700 square miles, is the denuded remnant of an old volcano. The central peak represents the column of lava which closed the volcanic life of the mountain. The crater has been gradually washed away. It consists of three zones. (1) A long forest-clad slope of low gradient composed of volcanic ash and débris. Starting on the Nyeri Plains at a level of 7,200 ft., it rises to 10,000 ft. above sea-level. (2) A zone of open moors and valleys, composed of agglomerates, ashes, and tuffs. It is separated from the forest belt by a sharp steep slope of 700 ft., representing the slope of the icefall of the great sheet-glacier that once covered the mountain. In its higher parts this second zone is split up by deep valleys into a complex series of ridges, which are often the beginning of ridges passing up into the arêtes of the central peak. This is the site of the old crater wall, now so eroded that no trace of the actual rim remains. (3) The central peak, which, as is usual with the cores of old volcanoes, is extremely rugged and difficult.

The glaciers of Kenya do not now descend below 15,300 ft., but it is quite clear that in former times the glaciation must have been very much greater. The scenery of the second or moorland zone of the mountain, with its irregular undulations and its numerous swampy mossy hollows, is highly characteristic of old moraines. Huge ice-worn erratics are strewn about. Everywhere are perched blocks, striae, roches moutonnées, and ice-worn lake basins, all affording indisputable evidence of former glaciation. This great terminal moraine extends

all round the mountain and could not have been formed by any system of mere valley-glaciers, but by a great ice sheet which covered the summit and filled up the whole of the valleys.

On the western edge of the Nyeri Plains, and separated from Kenya to the east by 50 miles of intervening plain, is the Aberdare range, striking north and south, and about 90 miles in length. This range, with its two principal heights of Satima and Kinangop (Nyanderua), consists of the denuded remnants of a series of volcanic cones built up on the plateau lavas, and are probably of the same age as Kenya. The rocks are basalt and phonolite with some beds of tuff.

To the north-east of Mount Kenya, between the Tana to the south, and the Guaso Nyiro to the north, is the volcanic range of the Jombeni (Nyambeni) Mountains. On the plains to the north-east of the range is the typical cup-shaped crater of Mgombe or Chiumbo with a great fissure on the east side. There are said to be soda deposits near Mgombe, and large mica deposits are reported to exist in the Jombeni Mountains.

The eastern slopes of Kenya in the district of Embu are deeply dissected with a constant succession of deep and rocky ravines, each of which carries down a tributary to the Tana.

To the north of Kenya, and each side of the Jombeni range lava-flows from the surface rock. The lava overlies the gneiss, and here and there gneiss hills and ridges protrude through it, such as the hogged-back ridge of Loldaika to the north-west of Kenya, and the great gneiss mass of Mount Shaba on the southern bank of the Guaso Nyiro. From the Jombeni Mountains to the Guaso Nyiro the ground falls in terraces, each terrace being the termination of a wave of lava-flow. In places along the southern bank of the river are great heaps of insecurely poised blocks of black vesicular lava. The blocks are perforated by innumerable holes caused by air bubbles when the lava was fluid, giving them the structure and appearance of dark brown and black sponges. They occur in plateaux and strips, often of considerable area, covering the country to a depth of 30 ft.

At Chanler's Falls the Guaso Nyiro passes through a gorge, the sides rising sheer to 60 or 70 ft. above the stream. The rock on the right is white trachyte, and on the left a dark basalt. The sill of the fall is basalt and is quite dry at low water, with narrow water-worn channels close to either bank. All the rapids on the river occur above this point where it has been affected by the stupendous outpourings of lava which appear on both banks.

From Chanler's Falls to the Lorian Swamp, a distance of about 100 miles, the surface of the country bordering on the river is calcareous loam which in places is no doubt alluvial.

The plateau of Marti or Erimba is situated on the left bank of the river about midway between Chanler's Falls and the Lorian Swamp. It is some 20 miles in length by 5 miles broad, its long axis being east and west, with a greatest elevation of 1,607 ft. above sea-level, and 603 ft. above the plain. It is composed chiefly of gneiss with large blocks of lava liberally sprinkled on its surface and sides. East of Marti, and round the Lorian Swamp there is soft black cotton soil.

In the northern part of the Protectorate volcanic rocks appear soon after passing to the westward of the track from Wajheir to Moyale, when the ground begins to be covered with blocks of lava. These increase in quantity as the Huri Hills are approached, and thence, westward to Lake Rudolf, and southward to Marsabit the formation consists of nothing else but miles and miles of sterile lava ridges divided by hard stony stretches of country, and salt encrusted flats. Hot winds blow regularly across this desert, and are the determining factor in the sculpture of the country, removing weathered rock material as soon as it appears on the surface, thus constantly exposing fresh rock to the erosive force.

Marsabit, which is 125 miles north of the Guaso Nyiro, is a regular-shaped volcanic mass, containing numerous craters and cones, with a lake in the main crater. The whole region shows signs of recent volcanic action. The mountain is encircled by a broad belt of lava, extending for 10, and in places 30 miles beyond its base.

A remarkable lava scarp runs from Balessa, to the west of the Huri Hills, to the Arsim watercourse, some miles south-west of Marsabit. Its total length is about 100 miles, and there are numerous bays and promontories. There is a sheer drop of 200 ft., on an average, to the west. In several places water breaks out at the foot of the scarp, and there are considerable salt deposits.

The Rift Valley traverses the volcanic region from north to south (see 'Descriptive Geography'). It is a strip of sunken land 30 to 50 miles in breadth. Once the plateaux on each side were continuous across it. If the edges of the beds exposed in the scarps of the Rift Valley be prolonged in imagination until they meet, the volcanic rocks would form a broad arch, some 130 miles across. The valley, therefore, represents what was formerly the highest portion of the highland zone before the arch fell in. The earlier volcanic eruptions, previous to the subsidence, had destroyed the structural-stability of the old gneiss plateau. The subterranean reservoirs were empty and masses of volcanic material piled upon the surface. The upper layers were thus overweighted above and weakened below, and earth movements to restore equilibrium were inevitable. The central arch left unsupported slowly subsided. The subsidence was gradual and spread over an immense interval of time. Evidence of this is afforded by the system of river drainage in the case of the Laikipia scarp, to which reference is made later. The straight lines and sharp angles, not yet moulded into curves by sub-aerial denudation, and the steepness and bareness of some of the fault-scarps show that the earth movements, which formed the valley, continued to a recent date.

There must clearly have been two or more phases of the volcanic activity which followed the subsidence of the valley, for Shombole and Lorgosailich are eroded stumps of old volcanoes, while Longonot is younger and well preserved. The remarkable perfection of some of the valley cones testify to the late geological date of the eruption, though something must be allowed for the relative aridity of the climate.

Things have not yet reached a condition of equilibrium in this region of Africa. In the Western Rift Valley two of the Mfumbiro Volcanoes, to the north of Lake Kivu, are still active, while the occurrence of earthquakes shows that it lies along a line of seismic disturbance. In British East Africa Teleki's Volcano, on the southern shore of Lake Rudolf, is stated to have been active within living memory. There is an active volcano near the mouth of the Kibish river, on the northern shore of the lake. Throughout the Rift Valley there are many phenomena showing a continued existence of volcanic activity, such as the numerous 'fumeroles' or steam-vents, which constantly emit clouds of steam. There are steam-vents in the craters of Suswa and Longonot, in the Enjororowa valley, on the northern flanks of Eburu, and on an island in Lake Baringo. At Kijabe there is a gas-hole which emits hydrochloric acid gas. The emission is periodic ; it is specially active between 3 and 5 p.m. There are many warm springs, especially round Lake Magadi and also in the Kedong valley, and near the northern end of Lake Hannington. A copious spring charged with gas, which is mainly, if not entirely carbon dioxide, issues in one of the small valleys at the head of the Ndo or Kerio Valley between Elgeyo and Kamasia. Between Gilgil and Elmenteita recent lavas have swept over the floor of the valley. The whole country to the north of Lake Baringo shows signs of very recent volcanic formation. The river Sugota, which runs northward through this region, is a chalybeate stream, hot and brackish, flowing between great walls of lava. The water of the river contains the following salts: sodium sulphate, magnesium chloride, calcium carbonate, potassium chloride, and traces of iron. After keeping, the water gives off an odour of sulphuretted hydrogen.

A full account of the walls of the valley, known as the escarpments, has already been given in the Descriptive Geography. They consist of a series of cliffs and platforms, representing respectively fault-scarps and fault-block surfaces. The number of scarps vary. Opposite Lake Magadi, on both

sides of the valley, they are specially numerous. Fault-block ridges are a noticeable feature of the Magadi region. These are narrow ridges bounded on either side by faults. They are formed by the land being subjected to unequal and varying stress, causing unequal subsidence, some parts sinking, while other parts remained stationary or did not sink so far. The formation is particularly impressive on the western side of the valley, above Lake Engeramai, where the fault-block ridges enclose valleys with precipitous sides several hundred feet high.

Speaking generally, the eastern wall is more rugged and steeper than the western or Mau escarpment. The causes of this difference are first the immense rainfall on the Mau Plateau, and second the greater accumulation on this western side of tuffs and other soft pyroclastics. Consequently erosion has been very active on this side. The west wall is the loftier of the two, and the fault-scarps must formerly have been more conspicuous there, but the heavy rainfall has eroded and obscured them. At the same time platforms have been aggraded on the floor of the valley by the detritus washed down from the heights above. The scarps tend to blend with the platform, thus producing an almost continuous slope from top to bottom. As a general rule only the lowest scarp is clearly defined as it lies below the region of greatest rainfall. This is well seen at Lake Nakuru, where a steep and definite cliff forms the west bank of the lake.

On both sides the rainfall steadily diminishes from top to bottom. Thus the upper scarps are well dissected by ravines, which pass across the first platform in narrow V-shaped gorges, 100 ft. or so in depth. On the second platform they diminish, and finally pass out on to the floor of the valley, broad and shallow, their sides disappearing and merging into low alluvial fans.

In the great embayment of the eastern wall between Ngongo Bagas and Kijabe, where the railway descends, there are three scarps and two platforms. Kijabe Hill, which forms the northern horn of this embayment, is composed mainly of

an olivine basalt, and is probably an old volcano, though there is no trace of a crater at its summit.

East of Lake Naivasha there are four distinct fault scarps and three terraces. At the summit of the fourth scarp is the Kinangop Plateau. The underlying rock is well exposed in the deeply cut gorges of the streams which cross the plateau, and consist of volcanic tuff and agglomerate. At Gilgil the trend of the eastern wall changes from NNW. to NW., owing to the Naivasha faults dying out and a new set of scarps arising to the west. The dwindling of the Naivasha scarps is accompanied by the branching of the faults which split up the fault-blocks into narrow belts. Some of the faults downthrow to the east, and thus with the opposing westerly-throwing faults produce fault-block ridges and trough fault valleys. A peculiar streaky rhyolite stands out prominently on the faces of these scarps. The floors of the valleys rise to the north, and as the scarps become smaller the general level of the surface is brought up to that of the plains above. These plains, a northward continuation of the Kinangop Plateau, are known as Angata Pus or Blue Plains. As far as Lake Olbolossat they are underlain by volcanic tuff and agglomerate. The plain is bounded to the east by a precipitous fault-scarp, known as the Laikipia scarp. The northern portion of the Aberdare Range rises above it, but the cliff due to the fault is clearly distinguishable. It is first recognizable north of Kipipieri and would appear to be continuous with the scarp which rises to the east of Baringo, and also bears the name of Laikipia.

The overflow of Lake Olbolossat drains out through a sharp gap cut into the Laikipia scarp, and joins the Guaso Narok. If the floor of the gap were raised a few feet the overflow would be turned south into the Morendat and Lake Naivasha. Evidently before the subsidence along the Laikipia scarp took place, the streams running off Sabugo Loldian must have flowed east across the Laikipia Plateau. When the subsidence began the streams were obstructed by the rising of the scarp and formed the swampy lake of Olbolossat, but

the overflow was able to cut down its channel as the scarp emerged. This is clear evidence that the subsidence took place with extreme slowness.

The western wall of the Rift Valley in the neighbourhood of Baringo consists of two immense fault scarps, separated by the deep, narrow Ndo or Kerio Valley, which drains to the north. The eastern and lower scarp, known as Kamasia, consists of volcanic rocks. The narrow plateau at its summit is underlain by porphyritic lava. The western slope of Kamasia is a dip slope, dissected by numerous streams. The rock is chiefly trachyte. The western and loftier scarp is known as Elgeyo. It consists of gneiss at the base, overlain by volcanic rocks. A porphyritic phonolite caps the gneissose schists, but is very irregularly distributed over them. The lava occurs in places below the level of the gneiss, showing that it was poured out over a very uneven surface. This thin strip of exposed gneiss runs some distance along the base of the escarpment.

The floor of the Rift Valley is a great plain of aggradation. No streams drain it outwardly, and no débris passes from it. All the streams entering it bring down large quantities of detritus which spread out in fans on the valley bottom. It might become filled with detritus in the course of ages, but if the Rift Valley ceases to exist it will probably be in another way, for erosion is rapidly removing the divide which separates it from the basin of the Victoria Nyanza.

Beds of sedimentary origin are of frequent occurrence in the valley, as in the neighbourhood of Lake Magadi, at Navaisha, near Gilgil, on the scarp to the east of Lake Hannington, and in the Ndo Valley. They consist sometimes of consolidated sands and fine gravels, sometimes of greenish mudstones or white thinly laminated shales.

The volcanoes of the Rift Valley, more especially the smaller ones, are composed of a greenish grey volcanic ash. The ash has been blown to a considerable distance during the eruptions, and is found banked against the fault-scarp in

various places. The banks of pumiceous lapilli near Gilgil have a similar origin. A very white pumice stone in lumps from 2 to 4 inches long forms terraces 10 or more feet in height in the Enjororowa valley, about 7 miles south of the southern end of Lake Naivasha.

Longonot illustrates the two phases of volcanic activity which followed the subsidence of the valley. The base of the mountain is made up of massive lava sheets deeply weathered, arranged in rude terraces, representing the earlier phase of volcanic activity. Then follow the less eroded younger lavas. The upper part is a great ash and tuff cone well dissected with deep ravines. The immense crater of Menengai, to the north of Lake Nakuru, is composed of coarse sanidine-bearing ash, and the whole country round is covered with this material, evidently thrown out of the crater. Eburu has a ridge-like formation which, together with the absence of cones, suggest that it may have been produced by fissure eruption. The Erri Mountains to the north of Lake Baringo are a group of denuded basic cones.

The floor of the valley is complex in structure. It is divided from east to west by transverse folds or ridges, forming a series of distinct basins, each of which is or has been occupied by a lake. There are also ridges running north and south, of which the most striking is that terminated to the south by Equator Peak. It is sloping towards the west and faces the east with a vertical fault face, thus forming a secondary Rift Valley in the floor of the main valley, which is occupied by the small lake of Solai and the much larger Lake Hannington.

The Rift Valley contains seven lakes. These in order from south to north are Magadi, Navaisha, Elmenteita, Nakuru, Solai, Hannington, and Baringo. Formerly there were others, perhaps four, which are now dry. They were formed at a time when the rainfall was much heavier. As the climate became more arid, and the earth movements, which produced the transverse ridges, cut off their extension to north and south, they dwindled in size or disappeared completely.

Lake Magadi is not a lake in the proper sense of the term but an enormous deposit of raw soda. The soda is of unknown depths, and for working purposes may be regarded as solid. When the soda is removed, saturated solution of soda wells up and fills the hole, and in time recrystallizes. The lake can be walked upon, and a light railway is laid down upon it. Hot springs charged with soda are everywhere. They vary greatly in temperature. One to the east of Engeramai has a temperature of 149° F., another 144° , and a third 134° . These springs, which contain in solution a large proportion of solids, are of plutonic origin, that is to say springs which are the survival of volcanic activity, originating in the depths of the earth's crust, and bringing water to the surface for the first time. The bulk of the soda is due to the deposition from these plutonic springs. Mr. J. H. Parkinson says: 'Plutonic water, charged with CO_2 , a common late accompaniment of volcanic activity, has split up the sodium silicates, which are characteristic of these alkaline rocks, into silica and sodium bicarbonate; the latter, dissolved and transported to the lower levels of the valley by gravitation, has segregated to form the lake as we see it, while the silica has been deposited near the source of origin.' Eighty per cent. of the soda in Lake Magadi is in almost equal parts of the carbonate and bicarbonate. There is only 0.07 of silica, and $15\frac{1}{2}$ parts of water almost complete the analysis.

On the rising ground to the west of Lake Magadi there is a bed of silico-calcareous limestone belonging to an old lake region. Large deposits of silica cover the bare brown mud flats round the lake.

In the alluvium which stretches northward from Lake Natron no rocks are exposed. There is much volcanic detritus in it, including lapilli of pumice stone. The southern Guaso Nyiro flows over these comparatively recent silts. It has not yet eroded its bed to base level, but forms rapids, one of which is 20 ft. in height.

The lake that once existed between Magadi and Naivasha has disappeared. The terraces of this vanished lake, to which

the name of Lake Suess has been given, are clearly visible on the eastern face of the valley. They show that the lake must have reached 400 ft. above the present floor, which is now a sandy plain traversed by the Kedong river. The ridge, crowned by the cone of Longonot, which separates the Kedong plain from the Naivasha basin, is certainly of later origin than 'Lake Suess', for the last lava flows from Longonot have spread out over the alluvium. The remarkable crater of Suswa was probably once a volcanic island in the vanished lake. The rock of which it is composed is chiefly red andesite and rhyolite: hence its proper name Ol Donyo Nyukie or the Red Mountain.

All the lakes of the Rift Valley are alkaline, though Lake Naivasha is only slightly so. Lake Elmenteita contains a good deal of carbonate of soda. The water of Lake Hannington has a putrid sulphurous flavour and is lukewarm. On its western shore are low cliffs, composed of siliceous sinter deposited by hot springs.

The greater freshness of Lake Naivasha has produced the theory that it has an underground outlet, but if so it is remarkable that the water does not come to light lower down in the valley. It may, however, be explained by the lake having dried up owing to climatic changes, and then having filled up again to its present level. The absence of fish and crocodiles is an argument in favour of its recent origin. Due south of the lake is a remarkable dry valley, called Enjororowa, which follows a winding course in a south-west direction for about 8 miles. It has evidently been eroded by a large stream, and is an old outlet of the lake. The floor of the valley at its intake is about 130 ft. above the lake, showing that the former lake-level must have stood at that height. Evidence of a similar outlet exists in the case of Lake Baringo, where the raised beaches at its northern end mark the old water level at a point where a pass leads northwards across the Erri Mountains.

Lake Sugota, marked on the maps between Lakes Baringo and Rudolf, is stated to have no existence. The region is little

known. Great mud flats are reported, covered with deposits of soda.

The plateaux on the summit of the escarpments to the west of the Rift Valley are generally more elevated than those to the east. The divide between the Rift Valley and the basin of the Victoria Nyanza is comparatively narrow. The descent from the summit of Mau Plateau to the Lake is about 4,350 ft., or an average of 70 ft. to the mile. The rainfall on Mau is about 60 in. Under these conditions erosion is a tremendous factor. The divide is being attacked with vigour, especially from the west. On the western slope, towards the Victoria Nyanza, deep and intricate ravines begin from the summit and unite to form permanent streams of great depth and volume, such as the Mara and Sondo rivers. Dissection has become mature, and there is an intricate system of divides and deep valleys, spurs, ridges, crests, amphitheatres, and pinacles. The V-shaped valleys are frequently 500 ft. in depth. Round Fort Ternan the country is more maturely dissected: fewer residuals occur, and the valleys become wider and more shallow as the Lake is approached. Finally the sides disappear and the rivers flow out on great alluvial fans and make their way over them into the Lake.

The lavas of the western plateaux are of much the same type as those of the Athi Plains and Kikuyu. The same distinct periods can be traced. In some places the earlier lava-flows have reached the Lake, whereas the more recent flows fall short by several miles, presenting steep terrace-like fronts. There is, however, a greater accumulation of tuffs and other soft pyroclastics on the western plateaux than on the eastern. On the road between Londiani and Eldama Ravine station tuff agglomerate is exposed in all the stream beds. The hill, on which the Ravine station stands, is composed of a dark compact fine-grained lava, very liable to decay. The mountains at the head of the Ndo Valley are composed largely of tuffs and agglomerates. This transverse range is deeply dissected by a complicated system of ravines, and is probably formed of one or more denuded volcanoes. In the Tigrish Valley,

trachyte is seen resting on rhyolite, which rests in turn on tuff. Opals are numerous in the Tigrish, but are so imperfect as to be of no commercial value.

On the western slope, from the summit of Mau to the Lake, the beds have a gentle dip towards the west, but less than the mean slope of the surface, so that in descending older and older beds are encountered, until at mile 541 on the railway, the lowest bed of tuff rests on the Archaean gneiss. The railway follows the deep cleft of the Nyando valley, bounded to the north by the Nandi escarpment, which is built up of serried columns of lava-flows. Eight miles north of Fort Ternan is the extinct volcano of Tindaret. The eastern wall of the crater is in a state of fair preservation. The west side has been torn away during the final eruption, which must have been of extraordinary vehemence. Tindaret is the only apparent focus of eruption to account for the sheet of volcanic deposits, mainly phonolite and ash, which stretch from Molo to Muhoroni.

The Uasin Gishu Plateau, the great grass plain to the north of the Nandi country, extending westwards from the summit of the Elgeyo escarpment, consists of sheets of lava very thick towards Elgeyo, but growing thinner towards the west. Patches of banded garnet gneiss begin to appear in the valleys on the west side of the plain, giving evidence of the approaching limit to the lava, which finally ceases a few miles before the descent into the Kavirondo country.

Mount Elgon, which bounds the Uasin Gishu Plateau on the north-west, is an extinct volcano, 14,584 ft. in height, and covering an enormous area. The lower part of the mountain is built in steps, due to its being composed of consecutive layers of volcanic ash and basic agglomerate, lofty precipitous cliffs marking the outcrop of the latter, and gentler slopes the outcrop of the softer ash. At the foot of the first step the primitive rocks, gneisses, and granites are exposed. One of its latest phases of activity as a volcano was to breach its crater wall on the east side, and through this chasm must have come the sheets of lava which now cover the Uasin Gishu Plateau.

The origin of the celebrated caves, which are found on the mountain at varying altitudes up to 8,000 ft., is disputed. Some authorities hold that they are artificial. It seems, however, most probable that they are water-worn, and that the flanks of Elgon were once denuded by the waters of the Victoria Nyanza, at a time when the Lake stood at a much higher level than it does to-day. There are no caves on the east side, but had they existed here all trace of them would have been obliterated by the recent lava flows.

In the volcanic area there are three chief types of soil: (1) red clay, (2) black cotton soil, (3) a yellowish grey loam. The red clay is found in forest-covered areas, or in those comparatively recently deforested. The black cotton soil covers the open treeless plains. The yellow loam is found only in the central portion of the Rift Valley. All three are derived from volcanic rock. The two former are residual accumulations, while the loam has undergone a certain amount of transportation, and does not overlie the rocks from which it is derived. The black cotton soil and red clay are not confined to any particular kind of lava but overlie all kinds. The theory that the red clay is derived from the older rocks, and the black soil from the more recent lavas may hold good for certain districts, but not for all. The explanation is probably to be found in climate and surface configuration which cause the mode of weathering to vary, and the same kind of lava to produce different soils in different areas.

The red clay is ferruginous and of an Indian red colour. Silica, alumina, ferric oxide, and water make up together over 90 per cent. of its composition. In the Kikuyu District, in the Mau Forest, and on the Uasin Gishu Plateau it forms a continuous surface covering, varying in thickness from 2 to over 30 ft. The red clay ends abruptly as soon as the forest ends. In the open glades of Mau, for example, it changes to black clay similar to the cotton soil. As soon as the forests of the Aberdare Range are entered either from the Nyeri Plains or the Kinangop Plateau the red soil begins and continues through the bamboo forest, which succeeds the lower forest at an alti-

tude of 9,500 ft. At the edge of the bamboo it ceases abruptly. In the belt of open country at the summit of the Aberdares the soil is a thin brown clay loam.

Muram or pisolitic iron ore is found beneath the red clay, where it thins away outside the forest-covered areas. It is generally from a few inches to 2 ft. thick. In the Mau Forest muram to a depth of 3 to 4 ft. is often found near the edges of the open spaces. On Nairobi Hill it is found under a thin covering of red clay. In Kikuyu the natives smelt it and make spears and knives from the iron. It is also an excellent metalling for roads on which vehicular traffic is light, as it breaks up easily and binds to form a hard smooth surface (see 'Communications'). The presence of muram is a sure sign of deforestation. When an area is stripped of forest, the rain begins to denude the soil, which is also exposed to great solar evaporation. The next rains penetrate readily, and carry down the iron oxide in solution, which is redeposited in a hydrated form on the evaporation of the water, and finally becomes cemented into a hard bed, like an 'iron pan'.

The black cotton soil is a fine black argillaceous clay similar to the 'regur' of southern India. During the dry season it becomes friable and shrinks considerably, so that its surface is seamed with cracks. It is commonly from 2 to 5 ft. deep, but near Kibigori it reaches a thickness of 20 ft. or more. Most of the cotton soil overlies volcanic rock, and the smaller portion overlying the gneiss is nearly always found in the neighbourhood of volcanic rocks or in the valleys of streams descending from a lava area. It is free from stones throughout its mass, except for bits of chalcedony. The black colour of the soil is considered to be due to its high content of humus. The volcanic rocks of British East Africa are particularly rich in alkaline, and the action of alkaline water in dissolving vegetable tissue is well known.

Black cotton soil differs from the red clay in being characteristically treeless, and is therefore subject to far greater evaporation. In all its occurrences it lies on level or gently rolling surfaces, where the rocky substratum is impervious

and the under drainage bad. The chief areas covered by this soil are the Athi and Kapiti Plains, the Kinangop Plateau, the Nyeri Plains, and the level plain between Kibos and Kibigori, at the head of the Kavirondo Gulf.

On the Laikipia Plateau the soil is black clay in the hollows, yellowish clay loam on the higher ridges, and red clay in the forest patches, more especially on the high ground to the west overlooking Baringo.

The soil on the Uasin Gishu Plateau is red ferruginous clay, often attaining to a great depth at the higher altitudes. In the flat parts, where the lava bed is near the surface, a yellowish clay is found.

The yellow loam occurs only in the middle portion of the Rift Valley from Lake Baringo to the Kedong river. The greater part of the valley, especially in its southern and northern parts, is superficially occupied by alluvial and pleistocene deposits, expanses of brown sand, alluvium, talus fans, and beaches round existing and former lakes. The yellow soil is found principally in the neighbourhood of Naivasha. It is a fine gritty pale yellowish soil, closely resembling the 'loess' of China and the 'adobe' of the semi-arid western states of America. Its nature is well seen in the gorge of the Morendat. Though it is so soft as to crumble easily between the fingers, it here forms vertical cliffs 100 ft. in height. Angular grains of the minerals contained in the lavas are distributed through it. The chief constituent is cleavage flakes of felspar. Fragments of augite, crystals of quartz, and chips of chalcedony are also found. The loam is a subaerial deposit derived from the waste of the rocks forming the fault-scarps and terraces carried down by ephemeral streams and general surface wash. Locally it is mixed with volcanic dust and pumiceous lapilli, especially round Nakuru and Longonot. It is derived from the same kind of volcanic rocks as the red clay and cotton soil, but differs in being derived chiefly by disintegration and not decomposition. An intermediate deposit is found at Kijabe on the edge of the Kikuyu forest. Here the trachyte has decomposed to a brownish clay, full of fresh unbroken

sanidine felspar crystals. Traced into the forest it becomes red, and the felspar crystals are completely decomposed, whereas in the yellow loam the felspar remains perfectly fresh but is broken up.

Beds of pure white clay occur in the loam, usually on the low ground away from the hills, such as those at the south end of Lake Naivasha and near Elmenteita. The clay is used in the manufacture of paper, and to some extent in the manufacture of a light-coloured brick. Fuller's earth has been found to the east of the Kedong river, but not in sufficient amount, and in too inaccessible a position, for marketable purposes. Concretionary nodules of lime or even thin beds of white limestone exist in the yellow loam, but here again not in sufficient quantities to be worked for building-lime.

THE LAKE ZONE

4. The fourth section into which the Protectorate was divided for geological consideration consists of the North and South Kavirondo and Kisumu Districts. It belongs partly to the volcanic area, the old lava-flows having reached the lake in places. The gneiss reappears at the surface, and there is a considerable amount of granite. Sedimentary rocks occur upon the gneiss. The section will be best treated in two parts, first the country to the north, and then that to the south of the Kavirondo Gulf.

As already stated, the lava-sheets covering the Uasin Gishu Plateau grow thinner towards the western side of the plain with increasing exposures of the underlying gneiss, the lava ceasing altogether some miles before the descent into the North Kavirondo country. Ildalat and Kekupe, on the western edge of the plateau, are typical examples of granite hills. From here to Mumias the rock is all a granite gneiss of the simplest composition. The country is studded with huge granite boulders. Close to many of the North Kavirondo villages a mass of granite with a flat surface forms the common threshing floor of the inhabitants. The station of Mumias itself is situated on lava, which occurs in patches in the

neighbourhood. Slabs of granite crop out through it. On the ridges and hills round Mumias granite appears at the surface in immense boulders and outcrops of rock. The Samia Hills, which divide the valleys of the Sio and Nzoia rivers, are formed of a synclinal bed of sedimentary rocks, at the base of which occurs the ironstone which is found all round Berkeley Bay. The ore is in pockets 40 yds. in diameter, which are scattered in a bed about 200 ft. thick. The strike is from NNE. to SSW., and the bed dips 80° east. The ore is a red haematite, containing phosphorus in appreciable amount and silica in very considerable quantities.

Reference has previously been made to the fact that there exists no evidence of any other formation between the volcanic rocks and the gneiss throughout the greater part of British East Africa. The only exception is in the Nandi and Samia Hills, where there is a formation of quartzites, phyllites, and ferruginous schists, which appear to be identical with the Karagwe series of Uganda. The Karagwe series lies between the gneiss and volcanic rocks, but has only a limited extension. The summits of the Nandi hills are occupied by mylonitic gneiss, interbedded with quartzites, and thus belong to the sedimentary, and not the Archaean series. The main part of the western slope of Nandi consists of amphibolite schists resting on fine grained syenitic gneiss.

On the Sioko river, to the south of Mumias, compact flinty rocks are exposed. Patches of lava occur at intervals along the road from Mumias to Kisumu, while towards Nandi a porphyritic granite is seen. This rock forms the Maragoli Hills, which bound the plain along the northern shore of the gulf. Just before reaching Kisumu a small lava plateau is crossed. The lava is a nepheline rock, showing good flow structure, belonging to the older series of lava-flows. Granite occasionally juts up through it as at Mumias. On the north side of the Kavirondo Gulf, from Kisumu to Uyoma, the primitive rocks are covered by a narrow lava cap 50 to 100 ft. thick.

On the line of the Uganda Railway gneiss first appears at

the surface near Muhoroni, about 40 miles east of Kisumu, and continues along the railway for 7 miles. It is a pale grey or pinkish banded rock consisting of quartz and felspar, with a small amount of mica in thin lenticular bands. The conical hills and irregular surface of the area occupied by the gneiss contrasts strongly with the flat-topped terraced hills of the volcanic rocks.

The level grassy plain between Kibigori and Kibos is covered with black cotton soil. It completely obscures the underlying rock which is probably volcanic, but there is no rock exposure till Kisumu is reached. Here the lava is a compact, nearly black phonolite.

South of the Kavirondo Gulf is a large area of volcanic rock resting on ancient quartz porphyries. It forms a grassy undulating country, like the Athi Plains, and is covered with black cotton soil. When the lava ceases, and the quartz porphyry is exposed, the ground is barren and stony. Along the rivers the lava is overlain by alluvium, and from these alluvial plains numerous symmetrical cones rise up very abruptly. The majority are composed of basalt, marking the final form assumed by the nepheline basalt when carved by atmospheric denudation.

A little to the south of Kendu is the crater-lake of Simbi. The water is exceedingly alkaline, impregnated mainly with carbonate of soda, and there are no fish. The lake occupies the site of an explosion crater, from which no lava has ever issued. Where the solid rock is exposed it consists of micaceous sandstone of the Pliocene age. Elsewhere the crater-walls are formed of thin layers of clay, dipping on all sides away from the centre of the crater, just as in the explosion craters of the Eiffel district in Germany. Probably the springs which gave rise to the lake are still active as it is steadily rising in level. On the margin of the lake are thin crystalline crusts of soda.

Limestone occurs in a dazzling white patch on the small low cliffs of micaceous sandstone between Kendu and the mouth of the Awach river, and again to the north of Mount Homa. On the south shore of Homa Bay is a lacustrine

deposit of gypsum, consisting of a narrow zone in thin white layers alternating with yellow clayey bands.

Mount Homa is the most conspicuous landmark on the southern shore of the gulf. It is a rugged isolated volcanic bluff, displaying successive scarps of ancient lava-flows. Lying roughly west of a line drawn from Mount Homa to Karungu Bay is a lofty basalt plateau with long spurs and outliers and abnormally wide denuded valleys. The latter are sometimes bare, but more usually covered with black cotton soil from 5 to 6 ft. in depth. The plateau culminates in the central summit of Gwasi, and falls down to the Lake in terraced cliffs of black basalt showing serried columnar form.

All the islands on the east coast, south of the Kavirondo Gulf, are composed of the same basaltic lava as Gwasi. They rise steeply out of the Lake and are evidently peaks of a submerged land.

Rusinga Island, off the mouth of the Kavirondo Gulf, consists entirely of volcanic rock, chiefly greenish grey tuff, often stratified. On the south-east side of the central hill there is a thin lenticular band of limestone which is worked for lime. As the bed dips into the hill on a steep slope it soon becomes too costly to remove the overlying beds. At the outcrop it is thin and of poor quality. Another deposit occurs about 1 mile to the east, of a harder and more compact stone. There are fully 2,000 tons in sight.

Outside the valleys of the basalt plateau of Gwasi to the south, the foundation of ancient crystalline rock is concealed for the most part by muram, and this orange ironstone soil cloaks hill and valley alike over a wide area. It has already been remarked that muram occurs chiefly where the land has been deforested, and it seems probable that the whole of this region, which to-day is almost entirely treeless, was largely forest-covered.

Near Karungu Bay lacustrine deposits of lower miocene age have been found. They consist of a varied series, about 150 ft. thick, of clays, sandstones, and gravels, striking ENE. and WSW. Isolated bones occur here and there, chiefly in

fragments, sometimes with a calcareous coating. Calcareous springs were evidently active at the period when these sediments were deposited, and the travertines precipitated by such springs often form continuous beds over a considerable area. The outcrop of the beds is limited in extent, and what remains of them is due to the fact that they were protected from denudation by floods of molten lava. Even before the eruption took place this series of soft clays, sandstones, and gravels must have suffered extensive denudation. Subsequently they were covered with a thick mantle of black cotton soil, so that these deposits only appear to view in a few gullies carved out by the temporary deposits of the rainy season.

To the south of the Kuja river, which enters Karungu Bay, all the rocks exposed are gneisses, crystalline schists, and old eruptive rocks. Along the frontier is hill upon hill of bare grey granite, such as the rugged granite peaks of Bingu. These ancient rocks form the long gnarled promontory of Mohuru, extending 7 miles into the Lake, and crowned with tors like those of Devon and Cornwall.

Following up the valley of the Kuja from Karungu Bay inland, a district of old volcanic rocks is entered, chiefly andesitic lava. It is much harder than the basalt and offers greater resistance to weathering. At Metamala there are piles of this hard rock, marking the neck or blocked-up chimney of a very ancient volcano, which once spread devastation far and wide over the surrounding country. The rock is a volcanic agglomerate full of rounded blocks of grey granite lying in a paste of dark green volcanic ash. The Kuja encloses this district in a great semi-circular bend due to the obstruction of these hard old volcanic rocks.

This region is succeeded to the east by an area of metamorphic rock. Long ridges of hornblende stretch to the south of the Kuja, while to the north is the smooth level plateau of Kamagambo, composed of ancient gneiss, weathered to a considerable depth into yellow and greenish white sandy clays. The Kuja has cut deep down into the gneiss, patches of river gravel being found 300 ft. above its present bed.

The plain is bounded to the east by the Kisii Highlands, which rise up from it in a steep escarpment, 1,000 ft. above its level, known as the Vinyo escarpment, consisting of great cliffs of old sandstone. Between the schists at the foot of the escarpment and the barren stony quartzites of the summit, an enormous mass of igneous rock has insinuated itself in a sill or layer of considerable thickness extending over a very large area. This intrusive rock has hardened and altered the overlying sandstones, converting them into tough quartzites, stained purple in places with haematite. At the actual junction of the two rocks the grey sandstone has been turned into snow-white quartz, forming a conspicuous band of colour in the hillside, and even the igneous rock itself has been modified, for it is saturated with quartz, and contains numerous round steam cavities, now filled with quartz and chalcedony. This igneous rock (dolerite) weathers much more easily than the hard quartzite. The slope is gentle, contrasting with the steep edge of the cliff above it, and it yields a rich red soil, like the red marls of Devon. Its greater fertility causes the native settlements to be congregated along its outcrop.

A similar escarpment bounds the Kisii Highlands to the north-west, known as the Manga escarpment. At the foot of this quartzite cliff is the rich district of Kitutu, a fertile region of weathered dolerite, overlying pink granitoid gneiss. This dolerite weathers into symmetrical cones, such as the fine outstanding cone of Saria to the south-west of Kisii station.

The ancient sandstones of the Kisii Highlands are similar to the Waterberg series of the Transvaal, where igneous rocks occur in the same way, and are probably of Devonian age. In former times they must have extended far beyond their present limit, and it is doubtless due to the greater hardness conferred upon them by the intrusive rock that has enabled them in this area to withstand denudation and remain to-day as the lofty Kisii Highlands. The original softness of the sandstone is shown by the fact that it retains raindrop and ripple marks, as exhibited on the large bare slabs exposed

on the edge of the Manga escarpment. The average trend of the ripple marks indicate a current proceeding from the SSE. at the time of the deposition of the beds. Similar beds occur on the west coast of the lake, and on Lake Tanganyika. The probability is that they were laid down in a fresh-water lake. The summit of the Kisii Highlands consists of wide grassy treeless downs of hard sandstone, rising to over 7,000 ft. above sea-level, carved into wide valleys by the Kuja and its tributaries. The streams on the highlands are chalybeate in character, leaving an orange deposit of iron ochre along the river beds, derived from the decay of the highly ferruginous sandstone.

To the west of Kisii station, at the south-west end of the Manga escarpment, the country continues at first composed of dolerite, probably at one time roofed over by the old sandstone of the highlands which has now been removed by atmospheric denudation. Beyond the dolerite is a great gneiss plain extending west as far as the basalt plateau of the Gwasi system, and northward to the lava region lying to the south of the gulf. It drops down towards the gulf in terraces. On the higher levels is a crimson brown sandy earth more than 6 ft. thick. Lower down the soil is yellow and sandy, resulting from the weathering of ancient gneisses and schists. The numerous broad valleys which intersect the country are quite dry in the hot season. Their formation goes back to a period when springs were more abundant and more active, and the climate considerably moister. The desiccation is doubtless due to the extensive deforesting practised by the natives for generations.

Geologists are of opinion that formerly the whole area between the Eastern Rift Valley in British East Africa and the Western Rift Valley or Central African Trough was occupied by a high rolling plateau of great elevation, composed of gneiss and schist. In its hollows were numerous lakes and swamps, forming the sources of rivers. Owing to volcanic eruptions disturbing the equilibrium of the country, the centre of this plateau subsided, forming a basin without

an outlet. The head streams of the rivers which rose upon it were cut off from their lower courses, and, reversed in direction, flowed towards the centre of the depressed region to form a great lake, which is to-day the Victoria Nyanza. The beheaded rivers now had their sources upon the outer slope instead of rising in the centre of the plateau. At this present day, between the Sio and the Victoria Nile, the watershed is almost on the shore of the lake, and the drainage lines running north have their sources in hills which border its coast. The formation of the two Rift valleys, to east and west of the Victoria Nyanza, caused the rivers, which flow into the Atlantic and Indian Ocean respectively, to be separated by a wide area of internal drainage. In time the lake, formed in the centre of the depression, overflowed, and its waters passed the barrier at its lowest point. The theory that the original outlet was down the Salisbury lake-chain to Lake Rudolf by means of the Turkwel valley is disputed. There is strong reason to believe that the Turkwel is a recently eroded valley, formed since the elevation of Mount Elgon, in the crater of which the present river rises. An alternative and more probable theory is that the outlet may have been to the north by way of the Ruizi valley, which joins the Sobat near Nasser. Later earth movements produced the gorge between Wadelai and Lado, and the great lakes of Central Africa found an outlet in this direction into the Nile.

The waters of the Victoria Nyanza are now steadily shrinking, for the swampy fringe on the extensive shallow stretches of the coastline is continually increasing. Ample evidence exists to show that the Lake once stood much higher than it does now. Traces of ancient beaches may be seen in various parts of Kavirondo many miles from the present coastline, while gravels and caves occur in much the same position on the western shore in Uganda. At Muhoroni, 40 miles to the east of Kisumu, gravel and boulder beds are found. Not far from Metamala, which is 17 miles inland, in a straight line from Karungu Bay, there are terraces of coarse gravel, marking an old beach line of the Victoria Nyanza, and similar

terraces are frequent in the valley of the Kuja between this point and the Lake. An additional proof of the original higher level of the Lake is afforded by the rounded contours of the landscape below the 4,000-ft. line. If the theory is correct that the Kisii Highlands were laid down in a fresh-water lake, and that the caves of Elgon were carved out by the action of water, the area and depth of the original Victoria Nyanza must have been enormous.

CHAPTER III

CLIMATE¹

General-Regional

GENERAL

THE territory of British East Africa comprises the coastal belt, which varies from 2 to 100 miles in depth, the plateau region, which may be said to have an average altitude of from 5,000 to 6,000 ft., and the lake district, which comprises a portion of the east coast of Victoria Nyanza, and has an altitude of about 3,800 ft. With such diverse physical conditions it naturally follows that the climate of each region presents distinctive features. Thus the coast area, with its high temperature and relative humidity, is damp and enervating; the highlands, on the other hand, possess a climate that is in every way desirable, while to the country bordering the great lake has been ascribed a climate 'less agreeable than in any other part of the Protectorate'.

Temperature.—Owing to the great differences in altitude, perhaps the greatest diversity in the climatic elements of the three regions occurs in respect to the mean temperature, which varies between 60° F. and 81° F. for the year; that is to say, within the confines of a country having an area only twice that of Great Britain, mean temperatures akin to those of Rome and Lisbon, on the one hand, and Calcutta and Hyderabad on the other, are experienced.

On the *coast* February to April are the hottest months, when the mean temperature varies from 79·4° F. at Pemba to 83·4° F. at Zanzibar, and farthest north to 84·9° F. at Kismayu. July and August are the months of least heat, the mean temperature varying between 73·2° F. at Pemba and 78·4° F. at Kismayu. Mean daily maxima are at their highest from February to April, and vary between 85° F. and 88·5° F.,

¹ For Climate tables see Appendix B: p. 583.

which cannot be considered excessive. The mean daily minima in July and August range from 68° F. to 74° F. Mean monthly maxima of 90° F. to 91.5° F. occur on the coast, and mean monthly minima from 62° F. to 71° F. The extremes registered in this region are 100° F. at Lamu and 60° F. at Mombasa. The range of temperature on the coast is not great compared with inland places, the highest recorded being 20.6° F. at Pemba compared with ranges of over 40° F. on the equatorial plateau. The temperature therefore is not excessively high, but the humidity is great, which renders the coast climate damp, very enervating, and unhealthy for white people. As regards temperature considerable uniformity is noted at the various stations along the coast.

In the *highlands*, which form the greatest part of the Protectorate, temperature is much lower. The mean temperature depends on the altitude of the station; at a height of 7,000 ft. (Limoru, Eldama ravine) the mean annual temperature is about 60° F., at Machakos (5,650 ft.) it is 64° F., and at Fort Hall (4,500 ft.) 66.7° F. The highest mean temperatures in the hot months vary between 62° F. and 69° F., the lowest in the cool months between 55° F. and 63° F. The daily maximum temperatures are highest from January to March, and range between 73.5° F. and 84° F. at Kikuyu and Fort Hall respectively, while the daily minimum is least from July to September, and varies between 45.4° F. at Naivasha and 51.2° F. at Fort Hall. The highest monthly maxima range between 80.8° F. (Limoru) and 91.3° F. (Fort Hall), the lowest monthly minima between 36.5° F. (Eldama) and 47.3° F. (Nandi). The highest absolute maxima registered are 96° F. in January at Fort Hall and 101° F. at Nandi, also in January, where temperatures of 98° , 99° , and 100° F. have been registered as well. Kikuyu, on the other hand, has an absolute maximum of only 81° F. in October. The lowest absolute minima are generally above freezing-point, with the exception of Eldama ravine, where 30° F. has been noted, and Sotik, where a temperature of 32° F. has been recorded. At most of the other stations the temperature has not gone below 38° F.,

the lowest temperature that may reasonably be expected in that part of the country. The range of temperature in the highlands is great, the maximum at some of the higher stations reaching as much as 40° F. to 43° F., about double the maximum observed at the coastal stations.

In the *Lake Victoria district* mean temperature results lie between those registered at the coast and on the plateau, the mean annual temperature ranging from between 66° F. (Rubja) and 74° F. (Kisumu). The highest mean temperatures are experienced for the most part in February and March, and vary between 67° F. and 76° F.; the lowest occur in July and August, and are from 65° F. to 72° F. Highest mean daily and monthly maxima are registered from 77° F. to 86° F. and from 83° F. to 94·5° F. respectively. Lowest mean daily and monthly minima range from 58° F. to 62° F., and from 54° F. to 59° F. respectively. The temperature at times is very high in this district; 110° F., for example, was registered at Port Florence in February 1904, where also the lowest temperature in these parts, 45° F., was noted in January the same year.

On the *southern frontier* temperatures are high, the mean temperature in the hottest months averaging 72° F. to 79° F., and in the coolest 62° F. to 75° F. Mean daily and monthly maxima at their highest reach 82° F. to 89° F. and 86° F. to 96° F. respectively. Mean daily and monthly minima at their lowest range between 54° F. to 62° F. and 49° F. to 58° F. respectively. The highest temperature registered in this neighbourhood is 102° F., the lowest 43·9° F. (at Amani in the Usambara district of what was formerly German East Africa). The range of temperature varies between 19·4° F. and 39·5° F.

Rainfall.—On the coast near Mombasa and again in Witu the rainfall is about 50 in. per annum, and the coast from the ex-German frontier to Witu, apart from the dry strip between Malindi and Formosa Bay, is rich in forest growth. Ten miles from the coast, proceeding westwards, the rainfall markedly diminishes, and for about 90 miles inland becomes a more or less rainless steppe, which extends northward to Somaliland. Some rain may be expected in this region between March and

May, but there is scanty vegetation, and in many places only bare soil. When an altitude of 5,000 ft. has been reached along the Kamba and Kikuyu highlands, rain is more plentiful and varies from 40 in. to 100 in. in the densely wooded slopes of Kenya, and to 50–60 in. in the Kavirondo district abutting on the lake. The heavy rainfall on Mount Elgon ceases abruptly a little distance to the north, where continuing to the shores of Lake Rudolf there may be 10 in. of rain in the year or less, some years being absolutely rainless. In the northernmost part of East Africa, between Lake Rudolf and the Juba river, rain is very scanty, and agriculture almost impossible. The country as a whole has a double rainy season, the first in April and the second in November. The driest months are July, August, and September, when the sun is well to the north, and in January when the southern declination becomes great. During the dry season there may be thick and wet fogs. This is the case in the Kikuyu district to a height of 9,000 ft., beyond which height the dry season ceases.

In the high plateau the rainfall increases as the traveller proceeds westward; at Kibwezi, 196 miles from Mombasa, only 28 in. fall per annum, at Machakos, about 300 miles away from the seaport, the total reaches 37 in., while at Fort Smith, to the south-west of Mount Kenya, in Kikuyu, an aggregate of 46 in. is precipitated in the year, which is without a distinct dry season. The following passage is taken from *Nature*, vol. 79: 'On the Kenia mountain range, just south of the Equator, and over 17,000 ft. high, there is a great contrast between the wet, misty southern slopes which have intercepted the rain, and the dry high country to the north, so that there was no snow at all on the north-eastern slopes from May to July. On the highest parts a steady north-east wind was blowing, between 6,500 ft. and 13,000 ft. the weather was calm and bright, below 6,500 ft. the wind was consistently south-east. On the northern high plateau 13,000 ft. high the climate was singularly mild and uniform, the air wholesome and bracing, no frost, little rain and that only at night.'

On the coast the rainfall increases from north to south,

from a mean of 15 in. at Kismayu to 47 in. at Mombasa, and 90 in. at Pemba, with an average for six stations of 51 in. In the highlands the rainfall varies between a mean of 32·35 in. at Naivasha and 68·43 in. at Nandi, the mean of eight stations giving an average of 49 in. On the north-east corner of Lake Victoria, the average annual rainfall appears to be about 46 in., but few data are available. On the south frontier an average of 51 in. per annum is given by the results of four stations on the south side of the border; while two stations on the northern side, Voi and Mwatate, about 100 miles from the coast, average about 19 in. a year.

The maximum rainfall per month has been registered for a few stations. On the northern shore of Victoria from 15–16 in. has been noted in the rainy months; at Nairobi 14 in. has fallen in February; on the southern frontier, near the slopes of Kilimanjaro, from 19 to 30 in. has been recorded, and at Pemba as much as 39 in. in April. At Mombasa a maximum rainfall of 8·15 in. has been noted in 24 hours. In the highlands the number of rain days are greatest in April and May, and vary from 16 to 24 per month. On the shores of Lake Victoria, broadly speaking, one day out of three in the year is a rain day. On the plateau the variation is great; at Naivasha, for example, there are but 91 rain days per annum, whereas there are 181 at Limoru. The average for eight stations is 129 days in the year. On the sea coast the variation is also great; at Malindi 60 days on an average are rain days while at Pemba the total is 154, the average for four stations being 114.

Relative humidity has only been taken at a few stations on the coast where it is high; oddly enough Malindi, with the least rainfall, has the greatest relative humidity, the mean for the year being 88 per cent., with a maximum for the year of 94 per cent. in July. The minimum of 82 per cent. occurs in October; and is the percentage representing the yearly average of the other coastal stations.

The prevalence of *thunderstorms* is due to local influences; at Eldama ravine and Naivasha there are on the average 116

and 76 respectively in the year, at Fort Hall and Kikuyu only 14 and 9. On the southern frontier they average 25 per annum. *Hailstorms* have occurred at Nandi and less frequently at Eldama ravine.

Cloud values as a rule are distinctly high ; at Kikuyu, Nairobi, and Zanzibar the yearly average is as high as 6, with maxima between 7 and 8. Fort Hall and Eldama ravine have lower averages, 2·5 and 3·6 respectively for the year, while at Neuwied at the south of Lake Victoria the mean of the year is 7·1. Mombasa has an average of 4·6 for the year, and while the cloudiness in no month sinks below 4, the maximum attained in May is no more than 6. In Kikuyu in the dry season, June and July, there is often a fog, mist, or drizzling rain until noon, when it is dispersed by the sun.

Winds.—The observations of wind are extremely meagre, and it is very difficult to generalize from them. On the north-east and east shores of Lake Victoria the winds throughout the year are southerly and westerly. There are daily breezes from the lake and the land : in the afternoon from the lake, at night and in the morning from the land ; consequently, in the daytime the trade wind is augmented, but at night the local wind blows contrary to it. The night, therefore, is calm compared with the daytime, when from 14 hr. a strong wind usually blows from the lake. On the *equatorial plateau* from December to February the prevailing winds are north-east and east, except at Naivasha, where the north-west wind prevails, and there are many windless days at Eldama ravine, and at Fort Hall the wind blows strongly and exclusively from the east during these months. From March to May the winds are again from the north-east and east, saving at Naivasha where a south and south-westerly wind blows when there is any breeze at all. In June the wind at Naivasha is exclusively from the south-west ; at Fort Hall and Eldama the east wind continues, while at other stations winds from the south-east, south, and south-west begin to claim a footing. The same conditions continue during July and August, but the north-

east wind has now disappeared and the south-east has taken its place. From September to November the winds are from the quadrant north-east to south-east, except at Naivasha, where the south wind is dominant, and at Fort Hall, where in the autumn months the winds are from the east and to a less degree from the south. On the *southern frontier* in the months December to February the winds are mostly from the quadrant north-east to south-east, with sporadic winds from other quarters. The same holds good from March to May, the east wind being dominant. From June to August the winds blow from east to south, the north-east wind diminishing and the south wind coming on instead. From September to November there is a return to the winter and spring conditions.

On the *sea coast* the prevalent winds in the months December to February are from the quadrant north to east ; in the months March to May the winds gradually change to south-east and south-west. From June to August the breeze blows steadily from the south-east to south-west quadrant, and continues till the late autumn, when winter conditions gradually reappear.

Wind strength has been measured at 6 stations on the plateau district, and it is found that the mean wind strength for the year varies from 1.3 to 2.1, with a mean for all the stations of 1.8, which is low compared with inland districts of England, and is only paralleled in Great Britain by inland places in the east of Ireland. The observations have, however, been mostly taken at 9 hr. in the morning, which is usually calm compared with the noon observation, so that no numerical comparison is advisable.

REGIONAL

Coast. Jubaland and Kismayu

The province of Jubaland has yet to be thoroughly explored, and its European residents are few in number, consequently

meteorological data are chiefly confined to meagre records observed at Kismayu. The data available permit, however, of a fair idea of the coastal climate in the vicinity being obtained, but for the conditions inland, reliance has to be made on the reports of travellers. The harbour of Kismayu depends for its trade on the monsoon winds, which blow with great steadiness. Trading ships coming from South Arabia with Indian goods while the north-east monsoon blows early in the year, after the six months of its duration are over, return from whence they came laden with local produce, assisted by the south-west monsoon. Apart from the important monsoon winds the most striking feature of the climate at Kismayu is the trying heat, which is aggravated by the glare cast by the roads made of crushed coral rocks and seashells, the sea sand, and whitewashed houses. The mean temperature for the year at this station, 81.6°F. , is the highest recorded on the coast. The maximum value of the mean temperature, 84.9°F. , is reached in April, the lowest mean temperature, 78.4°F. , is an attribute of July and August. In the interior of Jubaland a maximum temperature of 104°F. was registered at Afmadu in February 1901.

The rainfall is small, the mean of twenty years' records being only 15.14 in. May is the rainiest month with a mean of 5.50 in., a third of the year's total precipitation, while from August to March the rainfall in each month averages less than 1 in., January and February being practically rainless. The maximum rainfall recorded in any month was 13.03 in. in May 1910, the greatest precipitation in any year 29.53 in. in 1906. As regards minima every month except May, June, and July has been rainless, while in these months minima of 0.05 in., 0.84 in., 0.14 in. have been registered. The least rainfall recorded in any year from 1896 to 1916 was 6.68 in., the aggregate for the year 1903. The very considerable range in the extremes of annual precipitation suggest a very unstable rainfall, and this is borne out by analysis of the aggregate falls from 1906 to 1916, which shows that the mean annual fluctuation from the normal is as much as 30 per cent., and in that

comparatively short period has varied from +97 per cent. to -40 per cent. :

	1916.	1915.	1914.	1913.	1912.	1911.
Differences, per cent., from the normal	+29	+11	-3	-9	-40	-30
	1910.	1909.	1908.	1907.	1906.	
Differences, per cent., from the normal	+20	-38	-10	+42	+97	

Heavy storms occasionally occur from April to June, and as much as 5·97 in. has fallen in May in 24 hours. The mean number of rain days is 39·5, of which 29 fall in May to July. The density of the rainfall for the year is 0·38 in., the maximum, amounting to double the mean density for the year, occurring in May, and the minimum, 0·06 in. in January.

The only other data for this region are available in respect to the climate of Lugh, lat. 3° 48' N., long. 42° 39' E., on the Italian side of the Juba river on the north-east frontier, where observations were made by Ferrandi during 1896 and part of 1897. Here the mean temperature was 87·3° F. for the year, the highest mean, 90·7° F., occurring in April, and the lowest, 84·0° F., in July. The mean monthly maximum temperature was 97·6° F. for the year, the month of highest temperature being February with 105·4° F. The mean monthly minimum for the year was 75·7° F., with a lowest value of 71·2° F. also in February, which gives the great range of 34·2° F. for this month, the mean range for the year being 21·9° F. Extremes of 113° F. in February 1896, and 64·4° F., also in February 1896, have been recorded at this station. There are two rainy seasons in this district, in March-April and October-November, and heavy rains, especially in the later season, come with storms, but no statistics of rainfall are available. December to March appears to be the period with the finest, in the sense of driest, weather at Lugh.

Coast. Lamu and Malindi

South of Kismayu along the coast extend the districts of Malindi and Lamu with stations of the same name lying only

a few feet above sea-level for which a modicum of climatic information is available. The coast north of Malindi is arid, but better conditions are reached near Lamu though the rainfall steadily diminishes as the Equator is approached from the south. The mean temperatures of Malindi and Lamu are high and differ by little. The means for the year are 80.9° F. and 80.2° F., the maxima 83.7° F. and 82.2° F., in March and December respectively, which diminish to 77° F.– 78° F. in July or August. The highest mean daily maximum and mean monthly maximum at Lamu are 87.8° F. in December and 91.5° F. in February; at Malindi no full records have been kept. The mean daily and monthly minima at Lamu, 70.1° F. and 62.0° F., are lowest in August and in June. The absolute maxima recorded at Lamu in four years and Malindi in two were 100° F. in September and 89° F. in April and May, which are not trustworthy results, as the period available is very short. At Lamu an absolute minimum temperature of 52.0° F. was registered in June 1911. The range of temperature at Lamu, 16.5° F. for the year, is small and varies between 12.7° F. in October and 20° F. in February. The mean rainfall at Malindi for 20 years and Lamu for nine was 38.62 in. and 31.77 in. respectively. May is in each case the month of greatest rainfall, when a mean fall of 13–14 in. has been registered at each place. In April, May, and June about two-thirds of the annual rainfall is precipitated. At Lamu a maximum monthly rainfall of 21.6 in. has been measured in May and in the same month a maximum fall of 3.9 in. has been recorded in 24 hrs. The fluctuations of the rainfall from the normal from year to year at Malindi and Lamu are considerably less than is the case farther north, the mean fluctuation at Malindi being but 17 per cent., while at Lamu, about 85 miles farther north, it reaches 22 per cent. The range at Malindi during the period 1906–16 was from +51 per cent. to –38 per cent., while at Lamu the limits during the short period of seven years were +34 per cent. and –45 per cent., the year of maximum drought being 1912 in both instances.

DIFFERENCES, PER CENT., FROM THE NORMAL RAINFALL

	1916.	1915.	1914.	1913.	1912.	1911.
Malindi	-13	+18	-10	+20	-38	-3
Lamu	-12	+34	+13	+20	-45	-32
	1910.	1909.	1908.	1907.	1906.	
Malindi	-21	+17	+8	-2	+51	
Lamu	—	—	—	—	—	

The mean number of rain days at Malindi and Lamu are 72 and 70 respectively, or rather less than 1 day in five, which aggregates give a mean density of 0.54 in. at the former and 0.45 in. at the latter station. A few years' observations of relative humidity at 9 a.m. and 10 a.m. exist which show that the humidity at both places is high and especially so at Lamu. At Malindi the highest value was 90 per cent. in May, the lowest 78 per cent. in November with a mean of 84 for the year; at Lamu the month of highest relative humidity, 94 per cent., was January, while the lowest value, 85 per cent., occurred in August, the mean for the year being 90 per cent. There are no records available of thunderstorms, cloud or winds.

Coast. Mombasa District

Mombasa lies on an island of the same name separated by a very narrow channel from the mainland. The railway starts here for Uganda. For the first 20 miles the line rises steadily through well-wooded and park-like country until it reaches the summit of the Rabai hills. Here the expanse of the Taru desert begins and extends for rather more than 80 miles, until the highlands are reached, where, 196 miles from Mombasa, a station, Kibwezi (alt. 2,950 ft.), on the railway, furnishes us with some climatic data.

At Mombasa the mean temperature for the year is 79° F., with a maximum of 82° F. in March and a minimum of 76° F. in June and July. Mean daily and monthly maxima in March are 87° F. and 90° F. respectively, the corresponding minima being 72° F. in June and July, and 67° F. likewise in July. The absolute extremes are 98° F. in March and 60° F. in the

same month. The range of temperature owing to humid conditions is singularly small, varying between 13° F. in August and 17° F. in April, with an annual mean of 15.3° F.

At Kibwezi the mean temperature is highest in March with 76° F., lowest in July with 69° F. There is a secondary maximum of 74° – 75° F. in October. The mean for the year is 72° F., or 7° less than at the coast.

The rainfall at Mombasa is 47.8 in. per annum compared with 28 in. at Kibwezi. At Mombasa there is no month without rain, but January and February are the driest months. May is the wettest with an average of 13.49 in. per month. The number of rain days at Mombasa is 109 per annum, which gives a mean density of 0.44 in. of rain per rain day.

The fluctuations of the rainfall from the normal average about 21 per cent. per annum at Mombasa, which is slightly more than at Malindi, but rather less than at Lamu. During the period 1903–16 the maximum fluctuation occurred in 1906, when the rainfall was 53 per cent. more than the normal, but in 1914, when only 33 in. of rain were recorded, the deficiency amounted to about 31 per cent. of the normal, a record recalling the year of drought, 1898, when the Kismayu rainfall was 73 per cent., the Malindi rainfall 45 per cent., the Mombasa rainfall 46 per cent., and the Shimoni rainfall 50 per cent. of the normal.

Relative humidity is fairly high ; it is at its highest in April with 89 per cent., and is lowest in December with 74 per cent. ; the yearly average is 82 per cent. Cloudiness is pronounced ; it varies from 4 in winter to 6 in May, with a mean of 4.6.

The wind force is higher than at any other station in the country, averaging 2.7 for the year, and rising to 3.7 in July, with a minimum of 2.2 for November. From December to February north-east, north, and north-west winds prevail with few calms. In March the north wind diminishes and is replaced by south-east, which with north-east and north-west remain prevalent winds. In April the north-east wind disappears also and the prevalent winds are south-east, south-

west, and west. In May, June, and July, the winds blow exclusively from the quadrant south to west—the south-west wind being greatly prevalent and forming 80 to 84 per cent. of the prevailing winds. There are no calms. In August and September the winds still blow from the quadrant south to west, but the south wind is more frequent and the south-west less so.

In October the winds blow from south-east to south-west, the south-east becoming again dominant; while in November the south-east is still the prevalent wind, but forms only 35 per cent. of the total, the remaining 65 per cent., excepting 10 per cent. of calms, being distributed among the other directions. The distribution of the winds per cent. for the four periods of the year among the four quadrants is as follows:

			N.	E.	S.	W.	C.
Dec., Jan., Feb.	.	.	49	21·5	4·5	10·5	8·5
Mar., April, May	.	.	13	15	36	35	1
June, July, Aug.	.	.	0	1·5	56	42·5	0
Sept., Oct., Nov.	.	.	4	19·5	52	19·5	5
Year	.	.	16·5	14·5	36·5	28·5	4

The prevalence of the north and east winds during the winter and the south and west winds during the summer monsoons, it will be noted, is very marked.

Coast. Shimoni, Tanga, Pemba, and Zanzibar

The Zanzibar Protectorate consists of the two small islands Zanzibar and Pemba, and some adjacent islets. Good meteorological data are available for all this district, both on the mainland and the islands.

Zanzibar (alt. 72 ft.) and Pemba (alt. 50 ft.) have a very warm and moist climate, very trying to Europeans, as cool nights are rare, the temperature at night being not much below that of the day. There are two seasons, that of the north-east monsoon, which begins in November and gives place in April (the wettest month), to the south-west monsoon, which is the cooler of the two winds.

The mean annual temperature at Zanzibar is 80·1° F. and at

Pemba 76.5° F. At Zanzibar the mean temperature varies between 83.4° F. in February and 76.7° F. in July, at Pemba between 79.4° F. in March, and 73.2° F. in July, showing distinctly that the first mentioned has a warmer climate. The highest mean daily and monthly maxima at Zanzibar and Pemba are 86.9° F. in February, and 90.5° F. in March and 85.4° F. and 91.2° F., both in March, respectively, showing that February and March are the hottest months. The lowest mean daily and monthly minima at Zanzibar are 72.7° F. and 70.6° F., both in August, and at Pemba 67.7° F. in August and 65.7° F. in July, which shows that July and August are the coolest months. The absolute maxima registered at Zanzibar and Pemba are 92.8° F. in December (Zanzibar) and 95.0° F. in March (Pemba), which are not excessive compared with extremes farther north. The absolute minimum registered at Zanzibar is 67.8° F. in July and at Pemba 64.0° F. in September. The range of temperature is very small, varying at Zanzibar between 15.7° F. in March and 12.1° F. in June, and at Pemba between 20.6° F. in March and 14.8° F. in July, which is less than half the range of temperature prevailing on the high tablelands.

The rainfall at both stations is copious, the mean annual fall at Zanzibar and Pemba being 63.3 in. and 77.55 in. respectively. At both stations, April and May are the rainiest months, and these are followed by a comparatively dry period, until in October and November a renewal of rainfall takes place on a smaller scale. At Zanzibar and Pemba as much as 30.52 in. and 39.01 in. have been known to fall in April, while 93.00 in. and 105.24 in. have been the greatest annual down-pours so far recorded. The minimum annual precipitation at the two places is 42.00 in. and 54.02 in.; it is therefore apparent that a constant supply of rain is assured. Five to seven inches of rain have been known to fall in 24 hours at both these places. The mean number of rain days at Zanzibar, 88.8 and 104 at Pemba is not excessive.

Between Shimoni (lat. $4^{\circ} 38' S.$) and Zanzibar (lat. $6^{\circ} 12' S.$) there is a distance of about 110 miles, a distance very

little more than separates Dover and Yarmouth, but notwithstanding a difference of 15 per cent. in their respective annual rainfalls, a very general resemblance between the rainfall conditions at these two places, as well as at Tanga and Pemba, permit of all four stations being compared as one group. The mean rainfalls of Shimoni and Tanga (55 and 58·5 in.), both stations being on the mainland, show a small variation of about 6 per cent. as compared with the 15 per cent. greater rainfall at Zanzibar (63·3 in.) and the 41 per cent. greater precipitation at Pemba (77·5 in.). The resemblance between the rainfalls at the four stations, however, is very marked when the percentages of the total rainfall precipitated in each month are compared, and it is found that following a comparatively dry period from January to March there is a very heavy fall in April and May that is followed by another dry period and, in November and December, by a secondary wet season that is less marked at Shimoni than at the other stations :

PERCENTAGE OF TOTAL RAINFALL FALLING IN EACH MONTH

	<i>Jan.</i>	<i>Feb.</i>	<i>Mar.</i>	<i>April.</i>	<i>May.</i>	<i>June.</i>
Shimoni	2	1·5	6	21·5	30	8
Tanga	2·5	3·5	5·5	20	21·5	4·5
Pemba	3·5	2·5	8	30	21	6
Zanzibar	5	4	9·5	22	18	3

	<i>July.</i>	<i>Aug.</i>	<i>Sept.</i>	<i>Oct.</i>	<i>Nov.</i>	<i>Dec.</i>
Shimoni	8·5	4	3·5	4·5	6·5	4
Tanga	7·5	5·5	5·5	6·5	13·5	4
Pemba	4·5	2	1·5	3	9·5	8·5
Zanzibar	4·5	3	3·5	5·5	13·5	9

At Shimoni and Pemba slightly over half the year's rainfall is precipitated in the months April and May, as compared to about 40 per cent of the total fall at the two other stations in the same two months. The following statement, dealing with the seasonal changes in the amount of rainfall deposited, shows that the dry season from December to February is markedly drier on the mainland than on the islands, that Zanzibar has its driest season during the period June to August, and that apart from the intensely wet period from March to

May the rainfall at Pemba is precipitated very evenly over the remaining seasons of the year :

	<i>Rainfall in inches</i>				<i>Percentage of total rainfall.</i>			
	<i>Dec.-</i>	<i>Mar.-</i>	<i>June-</i>	<i>Sept.-</i>	<i>Period</i>			
	<i>Feb.</i>	<i>May</i>	<i>Aug.</i>	<i>Nov.</i>	<i>A.</i>	<i>B.</i>	<i>C.</i>	<i>D.</i>
Shimoni .	4·09	31·43	11·61	8·11	7·5	57·5	20·5	14·5
Tanga .	6·16	27·80	9·92	14·57	10·5	47·5	17·0	25·0
Pemba .	11·49	45·02	10·04	11·00	15·0	58·0	13·0	14·0
Zanzibar .	11·32	31·28	6·29	14·41	18·0	50·0	10·0	22·0

There is very considerable fluctuation in the quantity of rain falling from year to year : the mean fluctuation at Tanga reaches 26 per cent., or not far short of that of Kismayu, while at the other stations it varies between 17 and 22 per cent., as at Malindi, Lamu, and Mombasa, as the following statement indicates :

PERCENTAGE OF DIFFERENCE FROM THE NORMAL

	1915.	1914.	1913.	1912.	1911.	1910.
Shimoni .	.	—	+ 15	— 22	— 20	— 14
Tanga .	.	—	—	— 42	+ 2	— 41
Pemba .	.	— 20	+ 12	— 25	+ 7	+ 7
Zanzibar .	.	— 32	— 16	+ 5	— 7	— 10
	1909.	1908.	1907.	1906.	1905.	Mean.
Shimoni .	.	+ 14	— 12	+ 22	+ 47	± 20
Tanga .	.	+ 18	+ 7	+ 44	+ 44	± 26
Pemba .	.	—	—	—	—	± 17
Zanzibar .	.	+ 35	— 15	+ 47	+ 17	± 22

Although practically every month can be counted upon for an inch or more of rain at these stations, apart from the two super-wet months of April and May, and, to a less degree, November, a month may very well go by with little over half an inch being registered. As Table X indicates some very heavy monthly rainfalls have been recorded at these stations : for instance, at Banani, Pemba Island, 39 in. are registered in April 1905 and 37·5 in. in the same month in 1910 : at Zanzibar in April 1905, 30·5 in. were registered, and 27 in. in the same month four years later : at Tanga in April 1905, 32 in. were recorded, while at Shimoni, the same month, 27 in. fell, as compared with 15 in. at Mombasa, about 30 miles

farther north. The amount of rain that occasionally falls in the course of 24 hours at these stations is from the European standpoint stupendous. Thus at Tanga on one November day in 1896 8 in. of rain were recorded, while one October day in 1905, that year of remarkable rainfall, witnessed the descent of 8·04 in. At Pemba 6·35 in. were accorded on one day in April 1910, and 7·44 in. on a November day in 1907 at Zanzibar. The density of the rainfall (mean rainfall per rain day) is extraordinarily heavy at the island stations, but at Shimoni (0·49 in.), and at Tanga (0·46 in.) it is about the average for the country as a whole.

August and September are the months of lowest density at all four stations, and April and May the months of greatest density. At Pemba, it will be noted, the average April rain day furnishes over an inch and a quarter of rain, or about one-third of an inch less than the average rainfall during the entire month at Kew. The mean density for the year at Pemba and Zanzibar, over 0·7 in. per rain day, is only equalled, or exceeded, on two days in the year at Kew :

MEAN DENSITY OF RAINFALL IN INCHES

	<i>Jan.</i>	<i>Feb.</i>	<i>Mar.</i>	<i>April.</i>	<i>May.</i>	<i>June.</i>
Shimoni	0·33	0·29	0·45	0·94	0·78	0·44
Tanga	0·33	0·41	0·36	0·69	0·79	0·30
Pemba	0·54	0·59	0·74	1·28	0·95	0·69
Zanzibar	0·62	0·65	0·72	0·93	0·93	0·53

	<i>July.</i>	<i>Aug.</i>	<i>Sept.</i>	<i>Oct.</i>	<i>Nov.</i>	<i>Dec.</i>	<i>Year.</i>
Shimoni	0·34	0·18	0·33	0·37	0·36	0·31	0·49
Tanga	0·41	0·25	0·25	0·37	0·56	0·30	0·46
Pemba	0·46	0·35	0·44	0·56	0·73	0·70	0·74
Zanzibar	0·48	0·41	0·40	0·65	0·76	0·65	0·71

The very considerable range between the highest and lowest densities suggests the probability that the number of rain days in each of the four seasonal periods will not be proportionate to the amount of rain, and this is found to be actually the case when the data respecting rain days is analysed, the chief difference lying in the fact that the proportion of rainy days in the wet season is much less than the proportion of the total rainfall would suggest. Taking all four places as a whole

it is found that the percentage of rain days to rainfall is as follows :

Percentage of :	<i>Dec.-Feb.</i>	<i>Mar.-May.</i>	<i>June-July.</i>	<i>Aug.-Nov.</i>
Raindays . . .	16	38	23	23
Rainfall . . .	13	53	15	19

The number of rain days at each station and the proportion occurring in each season are as follows :

	<i>Number of days of rain.</i>					<i>Percentage of total number of rain days.</i>			
	<i>Dec.-Feb.</i>	<i>Mar.-May.</i>	<i>June-Aug.</i>	<i>Sept.-Nov.</i>	<i>Year.</i>	<i>Period</i>			
	<i>A.</i>	<i>B.</i>	<i>C.</i>	<i>D.</i>		<i>A.</i>	<i>B.</i>	<i>C.</i>	<i>D.</i>
Shimoni	13.3	40.9	36.6	22.6	113.4	12	36	32	20
Tanga .	17.7	42.6	30.7	36.4	127.4	14	33.5	24.5	28
Pemba.	18.8	45.5	20.5	19.4	104.2	18	43	20	19
Zanzibar	17.6	35.4	13.4	22.4	88.8	20	40	15	25

The small percentages of rain days in the winter at Shimoni, and in the period June to August at Zanzibar, and the comparatively large percentage of rain days at Tanga in the autumnal months are striking features of the above table.

The relative humidity at Zanzibar is considerable right through the year and shows a fluctuation of only 8 per cent. between the maximum of 87 per cent. in April and the minimum of 79 per cent. in February, the mean for the year being 83 per cent. Comparing these data with those for Mombasa, where the mean is 82 per cent., the maximum 89 per cent., and the minimum 74 per cent., it is seen that the range at the latter place, amounting to 15 per cent., is much greater than at the island station. At Shimoni, on the coast near the southern frontier, the one (9 a.m.) observation per day available indicates that the relative humidity in the morning is excessive, the mean of the month being as high as 94 per cent. in July and August, while the lowest mean attained in February is as much as 85 per cent., or 6 per cent. less than the average (91 per cent.) for the year, the latter percentage being highest on this coast.

As regards *cloudiness* there is no month when at Zanzibar it does not exceed 5, that is to say when the sky is not more than

half overcast. The cloudiest month, as might be expected, is April with 6·9, the clearest, June, with 5·3 ; the average for the other ten months is 6·2. It is stated that entirely cloudless days are very rare, but that the sky at night is comparatively clear.

Heat and damp in Zanzibar, coupled with the overcast skies, have a bad effect on European constitutions, and three years seems to be the limit of endurance after which a temporary change to a better climate is generally essential. In the interior of the island malaria is very rife.

The seasons at Zanzibar are two in number, but of unequal lengths, which may be defined by the prevailing winds, the north-east monsoon and the south-west monsoon, and less exactly by the seasons of the greater rain (*masiko*) and the lesser rain (*vuli*). These normally begin on March 4 and October 9 following the zenith positions of the sun. The greater rains fall from March to May, during the south-west monsoon, with, as already noted, a maximum in April. Then follows a rain pause until the end of June. A few very heavy downpours in July, the 'after-rains', are followed by several months with little rain, September being the driest ; but no month is without rain. Following the dry season come the lesser rains from the middle of October to the end of the year, with little rain in January and February.

The monsoon winds follow each other in fairly regular intervals, but vary in different years in intensity and duration. The north-east monsoon blows for three months from December to the beginning of March (during this month the winds are variable and there is period of transition), after which the south-west monsoon reigns for seven months, and is followed in November by a second period of transition, after which the north-east conditions start again. From December to February winds from the quadrants north and east form 77 per cent. of the total, with calms 5 per cent. From April to October winds from the directions south-east, south, and south-west (14 per cent. + 41 per cent. + 35 per cent.) comprise 86 per cent. of the total observations ; calms accounting

for 6 per cent. of the balance. In the months of transition calms are more frequent and reach 9 per cent. in March and 15 per cent. in November. The north-east monsoon reaches its full strength after the middle of December. With it come increase of temperature and humidity and decrease in air pressure. Accompanied by calms the south-west monsoon displaces it in March, bringing exactly opposite conditions of temperature, humidity, and pressure. By the end of March it is blowing strongly and does so till the end of June. In July and August the wind strength dies down, and for weeks may only be a gentle breeze, which in October is accompanied by calms which increase in number in November, and make room again for the north-east monsoon at the end of the month.

The remarkable uniformity of the wind direction on this part of the coast can be determined by comparing the following statement showing the percentage of winds from the various quadrants at four seasons of the year at Tanga and Zanzibar with the similar statement on p. 136 in respect to Mombasa :

December-January-February.

	N.	E.	S.	W.	C.
Tanga	39	44	10	5	2
Zanzibar	56.5	27.5	7	4	5

March-April-May.

	N.	E.	S.	W.	C.
Tanga	8	25	54	10	3
Zanzibar	11	10	53	19	7

June-July-August.

	N.	E.	S.	W.	C.
Tanga	0	18.5	73	8.5	0
Zanzibar	0	3	68	26	3

September-October-November.

	N.	E.	S.	W.	C.
Tanga	4	31	56	7	2
Zanzibar	4	23.5	50	10.5	12

Year.

	N.	E.	S.	W.	C.
Tanga	13	29.5	48	7.5	2
Zanzibar	18	16	44	15	7

It will be noted that at Tanga there is more east in the wind than at either Zanzibar or Mombasa, but apart from this

feature, due, perhaps, to purely local conditions, the agreement at all three places is singularly complete.

The two months of transition, it should be mentioned, are times of variable winds locally known as Tanga Mbili (the two sails), as they furnish the only periods during which sailing conditions favour trade between the island and the mainland in the barks of the natives. During the regular monsoons trade is carried on to the north, to India, the Persian Gulf, and the Red Sea, and to the south, to Madagascar and Portuguese East Africa. Unfortunately the exchange is not confined to trade, for diseases are also spread at the same time from one country to another.

South Frontier. Arusha, Moshi, Mwatate, and Voi

In the Seyidie province away from the coast but little information can be obtained, but at Voi station on the railway, alt. 1,990 ft., and at Mwatate, about 18 miles to the west, two years' temperatures have been observed. At Voi the highest mean temperature was 78.8° F. in February, the lowest, 72.1° F. in August, and 76.6° F. the mean for the year. The mean daily and monthly maxima were highest in November with 89° F. and 96.5° F. respectively, the corresponding minima were lowest in August with 62.5° F. and in April with 58.0° F. The rainfall is small, the average of six years 1911-16 being 16.61 in. per annum. The number of rain days average 64.

At Mwatate, which lies west of Voi towards the Kilimanjaro district, the highest mean temperature is 75° F. in March, the mean for the year being 71.6° F. The highest mean daily and monthly maxima temperatures are 88.7° F. and 94.2° F. both in March. The lowest mean daily and monthly minima are 58.5° F. and 50.5° F., both occurring in August. There are on the average 65 rain days, and 22.33 in. of rain annually. Thirteen days of thunderstorms are expected at Mwatate annually, about half of which occur in April. At Mackinnon Road station, 35 miles nearer the sea, the yearly average fall of rain is 27.1 in. on 13 years' records.

Moshi, 80 miles to the west of Voi, and in a line almost with the two stations considered above, may be taken with them for comparison. The mean temperature varies between 74.3° F. in February and 63.5° F. in July. The mean of the year, 68.7° F., is below the average of the neighbouring stations. The mean daily and monthly maxima are both highest in February with 86.2° F. and 91.4° F. respectively. The mean daily and monthly minima are lowest in July and August with values 57.7° F. and 54.5° F. respectively. The extremes are 93.6° F. in March and 50.5° F. in June. The range of temperature varies between 30.2° F. in February and 19.4° F. in June, the average for the year being 25° F., which is not excessive for that region. The annual rainfall is abundant, being 53.85 in., and the precipitation is collected by the trees of the primeval forest which cover the mountain slopes, upon which the existence of the entire settlement depends. April and then May are by far the rainiest months; by the end of May the rainfall diminishes suddenly, so that the average fall in June is only one-sixth of that in May. As much as 30.4 in. of rain has fallen in April, while the highest aggregate fall in any year is 69.6 in. As the least value of annual rainfall is 43.6 in., the precipitation has not a great range, and a steady supply is assured. The mean number of rain days is 123, with the highest number, 22, in April. It is cloudy all through the year. In the least cloudy months, January and February, the value is 4.3 on the average; from April to July the average is as high as 7.3, while for the year the mean is 5.8.

The rainfall records for the stations Arusha (Tanganyika Territory, south-west of Kilimanjaro), at an altitude of 4,610 ft., Moshi (Tanganyika Territory, south of Kilimanjaro), at an altitude of 3,769 ft., Taveta (British East Africa, south-east of Kilimanjaro), at an altitude of approximately 2,600 ft., Mwatate (British East Africa), at an altitude of 2,800 ft., and Voi (British East Africa), altitude 1,990 ft., these five stations extending in a straight line from west to east through a total distance of less than 150 miles, practically the same mileage

separating London and Cardiff, permit of interesting comparisons :

	<i>Rainfall in inches.</i>					<i>Percentage of total rainfall.</i>			
	<i>Dec.-Feb.</i>	<i>Mar.-May.</i>	<i>June-Aug.</i>	<i>Sept.-Nov.</i>	<i>Total.</i>	<i>Period.</i>			
	<i>A.</i>	<i>B.</i>	<i>C.</i>	<i>D.</i>		<i>A.</i>	<i>B.</i>	<i>C.</i>	<i>D.</i>
Arusha . .	10.50	27.36	2.28	8.31	48.5	21	57	5	17
Moshi . .	8.11	35.08	5.11	5.55	53.8	15	66	9	10
Taveta . .	5.40	11.26	0.70	4.36	21.7	25	52	3	20
Mwatate . .	6.03	10.23	1.16	4.91	22.3	27	47	5	21
Voi . .	5.85	6.48	0.72	3.53	16.6	35	39	4	22

It will be noted that apart from Moshi the percentage of annual rainfall precipitated in the period December to February is higher, at Voi and the other British stations considerably higher, than is usually the case in the Protectorate and its vicinity, and that the percentage for the period June to August is exceedingly low. Taking the district as a whole it is found that a quarter of the year's rainfall is precipitated in the period December to February, half (52 per cent.), in the three months March, April, and May, a mere twentieth part from June to August, and the balance (18 per cent.) of about one-fifth in the autumnal months September to November. How these figures compare with other districts in the Protectorate is shown in the following statement :

PERCENTAGE OF TOTAL RAINFALL PRECIPITATED IN PERIOD

<i>District.</i>	<i>Dec.-Feb.</i>	<i>Mar.-May.</i>	<i>June-Aug.</i>	<i>Sept.-Nov.</i>
Kismayu . .	1	49	39	11
Malindi-Lamu . .	3	57	26	14
Mombasa . .	8	50	20	22
Tanga-Shimoni . .	9	52	19	20
Zanzibar-Pemba . .	16	54	12	18
Arusha-Voi . .	25	52	5	18
Kikuyu-Nairobi . .	19.5	49.5	8.5	22.5
Kenya . .	11	49	9	31
Naivasha-Nandi . .	12	36	32	20
Sotik-Lumbwa . .	15	36	27	22
Kisumu-Mumias . .	18.5	37	23.5	21
Lake . .	21.5	41.5	14.5	22.5

As only 13 per cent. of the total rainfall of British East Africa falls on an average in the three months December to February, it will be noted that the proportion of the year's precipitation falling during that period in the Arusha-Voi

district is very high. The March to May percentage, 47 for the Protectorate as a whole, presents no unexpected features, but the June to August percentage, which is 20 per cent. for the whole country, is extraordinarily low for Arusha-Voi, a feature it has in common with the neighbouring districts of Kikuyu and Kenya. Twenty per cent. of the total rainfall of British East Africa may be expected to fall from September to November, and although the north coast stations do not attain this percentage, and the mountainous district of Kenya exceeds it, no great diversity is marked elsewhere.

Relative humidity at Moshi varies between 65 per cent. in February and 83 per cent. in May, the mean for the year being 72. The relative humidity at 7 a.m. is broadly speaking, 50 per cent. greater than at 2 p.m., and 20 per cent. greater than at 9 p.m., the means of the year being 86 per cent., 58 per cent., and 71 per cent. respectively. The maximum for each hour of observation is attained in May, but whereas the minima at 7 a.m. and 9 p.m. are found in January, February, or March, at 2 p.m. the minimum occurs in October. The mean minimum humidity at 2 p.m. varies between 55 per cent. in May and 28 per cent. in March, while the mean of the year is 39 per cent. The lowest minimum recorded at 2 p.m. in seven years at Moshi was 20 per cent. in January :

RELATIVE HUMIDITY AT MOSHI AT HOURS OF OBSERVATION

	<i>Jan.</i>	<i>Feb.</i>	<i>Mar.</i>	<i>April.</i>	<i>May.</i>	<i>June.</i>
	%	%	%	%	%	%
7 a.m.	81	81	81	92	93	88
2 p.m.	53	52	60	69	72	65
9 p.m.	65	61	69	82	83	75
Mean of the day	66	65	70	81	83	76
Mean minimum at 2 p.m. . . .	35	32	28	49	55	50
Absolute minimum at 2 p.m. . .	20	26	27	32	48	41

	<i>July.</i>	<i>Aug.</i>	<i>Sept.</i>	<i>Oct.</i>	<i>Nov.</i>	<i>Dec.</i>	<i>Year.</i>
	%	%	%	%	%	%	%
7 a.m.	88	91	86	84	85	82	86
2 p.m.	62	60	53	47	51	54	58
9 p.m.	73	72	70	68	71	67	71
Mean of the day	74	78	70	66	69	68	72
Mean minimum at 2 p.m. . . .	47	41	32	31	33	38	39
Absolute minimum at 2 p.m. . .	44	28	29	27	26	29	—

Thunderstorms are most in evidence in April, when there are on the average 9 days of thunderstorms, the mean for the year being 26.9. *Fogs*, of which there are about 46 per annum, are mostly prevalent in May (mean 8, maximum 21) and August (mean 8, maximum 20), but no month is absolutely immune from fog.

Moshi is windiest in September to November, when the mean wind force is 2.8. January and May to July are calmest with a mean of 1.5 to 1.7. The average for the year is 2.0. All through the year the south-west, west, and north-west winds are infrequent, as is shown in the following seasonal table : -

<i>Moshi.</i>	<i>N. + NE. + E.</i>	<i>SE. + S.</i>	<i>Calm.</i>
Dec.-Feb. . .	14+ 15+ 16 = 45%	10+ 8 = 18%	16%
Mar.-May . .	8+ 14+ 23 = 45%	14+ 10 = 24%	15%
June-Aug. . .	3+ 14+ 19 = 36%	14+ 15 = 29%	22%
Sept.-Nov. . .	3+ 21+ 26 = 50%	18+ 11 = 29%	11%

It will be apparent from the above that a low percentage only is left for westerly winds, which are most prevalent (south-west 6, west 9, and north-west 7) from December to February.

Equatorial Plateau. Nairobi, Machakos, Kikuyu, Limoru

In the Kikuyu district four stations are available: Nairobi (alt. 5,450 ft.), Kikuyu (alt. 6,700 ft.), and Limoru (alt. 7,270 ft.) situated on the railway, and Machakos (alt. 5,650 ft.), which is at the south-east corner of the district. Within the short distance of 15 miles the line between Nairobi and the Kikuyu escarpment rises 1,300 ft., while another 500-600 ft. rise occurs in the following 10 miles to Limoru, which makes the climatic differences interesting.

As regards mean temperatures, those of Limoru, Kikuyu, Nairobi, and Machakos *in this order* are 59.4° F., 61.1° F., 63.3° F., and 64° F. for the year. The highest values are 62.1° F., 63.5° F., 65.8° F., and 68.2° F., the first and last in February and the other two in March. The lowest mean temperature values are 54.6° F., 56.4° F., and 59.4° F., all in

July. The difference of from 3°—5° F. between Kikuyu and Limoru and the other stations is due to the increased altitude.

The mean daily and mean monthly maxima of the four stations in the same order have highest values, 75·4° F., 73·5° F., 78·4° F., 80·6° F., and 80·8° F., 82·8° F., 79·2° F., 84·8° F., and 85·4° F. respectively. These are registered in February at all four stations. The lowest mean daily and mean monthly minima nearly all occur in July; the daily minima in the aforementioned order are 46·3° F., 47·7° F., 49·5° F., 46·2° F., and the monthly minima, 40·8° F. in September, 40·5° F. (August), 41·9° F. (July), and 41·4° F. (July) respectively. The range of temperature varies between 22·3° F., the minimum at Kikuyu, to 41° F., the maximum at Machakos. The results are high compared with the coastal and the Lake Victoria regions.

The absolute maxima and minima extremes are: at Limoru, 89° F. in January and February, and 36° F. in July and August; at Kikuyu, 81° F. in October, and 40° F. from June to August; at Nairobi, 89° F. in February, and 36·5° F. in August; at Machakos, 88° F. in February, and 33° F. in December 1912. That the lowest minimum should not be found at Limoru or Kikuyu, whose altitude is so much greater than that of Machakos, is doubtless due to the fact that very few years' data are available for these two stations.

The average annual rainfall for the four stations is about 43 in. per annum; the maximum, 52·77 in., occurring at Limoru, the least, 36·61 in., at Machakos, compared with about 24 in. at Kew. A certain amount of rain falls in every month of the year, but April is the rainiest month with an average of 10 in. There is a secondary maximum fall in November, when the average for the four stations is 6–7 in. July and the months near it are the drier months when the average rainfall does not exceed 1–2 in. The percentage of total rainfall precipitated in each month is as follows:

	<i>Jan.</i>	<i>Feb.</i>	<i>Mar.</i>	<i>April.</i>	<i>May.</i>	<i>June.</i>
Limoru	4	6	9	23	20	5
Kikuyu	3·6	7·5	14·4	23	16	5
Nairobi	5·5	7	12	22	14	5
Machakos	3·5	8	16	22	7	2

	<i>July.</i>	<i>Aug.</i>	<i>Sept.</i>	<i>Oct.</i>	<i>Nov.</i>	<i>Dec.</i>
Limoru	2	4	3	5	13	6
Kikuyu	1·8	2	3	4·5	12	7·2
Nairobi	2	3	3	5	15	6·5
Machakos	1	1	0·5	6	20	13

It will be noted that, with the possible exception of Machakos that enjoys one-third of its annual precipitation in the months of November and December, and has a much drier May than the other stations, the results shown above are very uniform. The same uniformity is also observed in respect to the annual fluctuation from the normal of the rainfall, which varies between 13 per cent. at Limoru and 17 per cent. at Machakos :

PERCENTAGE OF FLUCTUATION OF RAINFALL FROM THE NORMAL

	<i>1916.</i>	<i>1915.</i>	<i>1914.</i>	<i>1913.</i>	<i>1912.</i>	<i>1911.</i>
Limoru	0	+2	-13	+2	+43	+15
Kikuyu	+3·5	-14·5	-10	-25	+15	0
Nairobi	+16	-7	+4	-14	+39	+5
Machakos	-3·5	-4	-5	+28	+53	+4

	<i>1910.</i>	<i>1909.</i>	<i>1908.</i>	<i>1907.</i>	<i>Mean fluctuation.</i>
Limoru	-34	-5	-10	-4	±13
Kikuyu	-46	-22	—	+6	±16
Nairobi	-31	-12	-30	0	±16
Machakos	-24	-18	-23	-10	±17

At Nairobi a maximum monthly precipitation of 13·9 in. has been registered in February. At Nairobi the maximum and minimum annual rainfalls are 55·86 in. and 25·62 in., and at Machakos 58·32 in. and 21·37 in. The number of rain days fluctuate between 103 at Machakos and 179 at Limoru, the average for the four stations being 129. Of these about one-eighth occur in April. The mean density of the rainfall (rain in inches per rain day) is comparatively low for equatorial Africa, the mean of the year being 0·295 in. at Limoru, 0·36 in. at Kikuyu, and 0·35 in. at both Nairobi and Machakos.

Thunderstorms are said to average from 8–9 per annum at Kikuyu and Nairobi, while at Machakos the average is rather over 38 per annum. At Kikuyu *cloud values* are high : the minimum, which occurs in February, is 4·3 ; the maximum, 7·9, occurs in July, and the yearly mean is 6, representing

a sky three-fifths overcast. At Nairobi the values are somewhat less in the early months of the year, and average 4.1 for the period January to March, but all the rest of the year cloudiness is great, the average for the other months being 6.9, with a maximum of 7.9 in August. Machakos is less cloudy, the average from January to March is 4.4, while for the remaining months it is 5.6, with a maximum of 6.1 in August. Fog and wet mist are prevalent in the whole district during the less rainy months, excepting only mountains of over 9,000 ft., where there are no comparatively dry months.

There are no wind records at Limoru, so the following remarks only apply to the three other stations. The wind force is moderate, June is the windiest month at Nairobi and Machakos. Kikuyu has rather more wind force than either of the other stations, the force averaging 2.1 for the year, with a maximum of 2.7 in December. The mean annual force for the three stations is about 1.9 only.

From December to January the prevailing winds of the region blow from the quadrant north to east. From March to May the north wind begins to lessen and the south-east increases, so that the prevailing winds come from the quadrant north-east to south-east. In the months June, July, and August, the prevalent winds at Kikuyu and Machakos are east and south-east, at Nairobi south and south-west. From September to November the winds return again to the quarter north-east to south-east, except that at Nairobi the south-west wind is still fairly prevalent in September. Calms are rare at Kikuyu, at the two other stations they average about 8 per cent.

WINDS IN QUADRANTS, PERCENTAGE OF OBSERVATIONS

December-January-February

			N.	E.	S.	W.	C.
Kikuyu	.	.	34	62	2	2	0
Nairobi	.	.	48	39	0.5	2	10.5
Machakos	.	.	26.5	62	6	0.5	5

March-April-May

Kikuyu	.	.	25	46	15	11	3
Nairobi	.	.	22	39	14	12	13
Machakos	.	.	23	54	10	1	12

June-July-August

	<i>N.</i>	<i>E.</i>	<i>S.</i>	<i>W.</i>	<i>C.</i>
Kikuyu . . .	7	42	35	13	3
Nairobi . . .	7	15	43.5	26.5	8
Machakos . . .	14	51	17	7	11

September-October-November

Kikuyu . . .	10.5	63.5	21	1	4
Nairobi . . .	26	49	14.5	7	3.5
Machakos . . .	11	70	14	0	5

Year

Kikuyu . . .	19	53	18	7	3
Nairobi . . .	26	35.5	18	12	8.5
Machakos . . .	18.5	59	12	2	8.5

Equatorial Plateau. Kenya district

In the Kenya province very little meteorological data is available apart from the rainfall statistics and several years records for Fort Hall, a station that lies to the south of the province, and about 45 miles to the SSW. of the summit of Mount Kenia, an eminence that attains an altitude of 17,000 ft. about 12,500 ft. higher than the altitude of the afore-mentioned station. The mean temperature (66.7° F. for the year) of Fort Hall is higher than the other plateau stations, but this is accounted for by the fact that the altitude is only some 700 ft. above the level of Lake Victoria. Its highest value is 69.4° F. in March, or 6.7° F. higher than the lowest mean temperature of any month in the year (62.7° F. in July). The mean daily and monthly maxima are highest in March, 84.1° F. and 91.3° F. respectively; the mean daily and monthly minima occur in January (51.2° F.) and August (45.4° F.) respectively. The maximum extreme is 96° F. in January and 40.0° F. in both July and September. The range varies between 40.8° F. in January and 32.4° F. in December, and is therefore high.

The mean rainfall of Fort Hall, 48 in., is above the average, in fact, as a rule, south of the Kenya range the rain supply is good, while sufficiently far to the north to be out of the influence of the mountain, the country is waterless and arid. As is the case with the other plateau stations April is the rainiest month, with a mean rainfall of 13 in.; there is a

secondary maximum in November when the mean is 8·4 in., and there are three dry months, July to September, when the mean rainfall is less than 1 in. The number of rain days is 122, of which April has 23.

Rainfall statistics for three complete years (1914-16) are available for Meru, a station on the northern slopes of Mount Kenya at an altitude of 5,300 ft., and when these are compared with data for the same years at Embu, on the south-easterly slopes, Fort Hall to the south, Nyeri on the south-west slopes, and at the settlement of West Kenya, a day's march from Nyeri, it is found that the Meru mean rainfall was 18 per cent. greater than that at Fort Hall, 33 per cent. greater than at Embu and West Kenya, and double as much as at Nyeri. It should be mentioned that the West Kenya forest statistics are for a period of 4 or 5 years from 1911 to 1915 inclusive. The results month by month are as follows :

	<i>Jan.</i>	<i>Feb.</i>	<i>Mar.</i>	<i>April.</i>	<i>May.</i>	<i>June.</i>
	in.	in.	in.	in.	in.	in.
Meru	2·80	0·08	4·11	13·00	9·85	0·11
Embu	1·20	0·60	3·70	12·70	6·90	2·00
Fort Hall	2·30	0·04	6·12	12·91	8·90	0·78
Nyeri	1·40	1·46	1·88	7·13	6·75	1·17
W. Kenya Forest	1·68	1·80	4·10	9·62	5·69	3·24
<i>Mean</i>	1·88	0·70	3·98	11·07	7·62	1·46
Percentage of total fall	4·0	1·5	8·6	24·0	16·5	3·0

	<i>July.</i>	<i>Aug.</i>	<i>Sept.</i>	<i>Oct.</i>	<i>Nov.</i>	<i>Dec.</i>	<i>Year.</i>
	in.	in.	in.	in.	in.	in.	in.
Meru	0·50	0·64	1·80	5·05	16·85	5·13	59·92
Embu	1·07	1·25	1·06	3·83	10·36	1·00	45·17
Fort Hall	0·98	0·65	1·86	4·85	9·87	1·92	51·18
Nyeri	1·32	1·88	1·56	1·63	2·91	1·48	30·57
W. Kenya Forest	1·60	1·93	1·95	2·45	7·77	3·21	45·04
<i>Mean</i>	1·09	1·27	1·65	3·56	9·55	2·55	46·38
Percentage of total fall	2·3	2·7	3·5	7·7	20·7	5·5	100

The most striking divergence from figures representing the mean rainfall of the district is found in respect to the November rainfall at Meru that averaged over 13 in. for two years and amounted to 24 in. in 1914. Taking the district as a whole,

it is found that 11 per cent. of the year's rainfall is precipitated from December to February, 49·3 per cent. in the three months March, April, and May, 9·1 per cent. in June, July, and August, and the balance of 30·6 per cent. in September, October, and November, the latter percentage being decidedly high for this country even when allowance is made for the excessive rainfall at Meru. The amount of rain falling at four periods of the year at each of the stations, and the percentage of the whole fall was as follows :

	<i>Seasonal rainfall in inches.</i>				<i>Percentage of total rainfall.</i>			
	<i>Dec.- Feb.</i>	<i>Mar.- May.</i>	<i>June- Aug.</i>	<i>Sept.- Nov.</i>	<i>Period.</i>			
	<i>A.</i>	<i>B.</i>	<i>C.</i>	<i>D.</i>	<i>A.</i>	<i>B.</i>	<i>C.</i>	<i>D.</i>
Meru . . .	8·01	26·96	1·25	23·70	13	45	2	40
Embu . . .	2·30	23·30	4·32	15·25	5	51·5	9·5	34
Fort Hall . .	4·26	27·93	2·41	16·58	8	55	5	32
Nyeri . . .	4·34	15·76	4·37	6·10	14	52	14	20
W. Kenya .	6·69	19·41	6·77	12·17	15	43	15	27
<i>Mean</i> . . .	5·12	22·67	3·83	14·76	11	49·3	9·1	30·6

Full statistics for a longer period (16 years) appear in the tables that follow in respect to Fort Hall, and the normal for 9 years at Embu and 13 years at Nyeri is given below :

	<i>Jan. in.</i>	<i>Feb. in.</i>	<i>Mar. in.</i>	<i>April. in.</i>	<i>May. in.</i>	<i>June. in.</i>
Embu . . .	0·87	1·2	2·97	11·22	6·05	1·6
Nyeri . . .	1·29	1·56	2·53	7·46	7·01	1·36

	<i>July.</i>	<i>Aug.</i>	<i>Sept.</i>	<i>Oct.</i>	<i>Nov.</i>	<i>Dec.</i>	<i>Year.</i>
Embu . . .	1·02	1·28	0·65	4·34	8·74	2·73	42·72
Nyeri . . .	1·16	1·52	1·01	2·70	4·80	2·62	35·02

Thunderstorms at Fort Hall average 14 in the year, of which about half occur in April.

Cloudiness is not so great, its maximum value at 9 a.m. is 4·8 in April, while the minimum value is 1·2 in September, the mean for the year being 3·6. The wind force is small, the greatest mean force being 2·4 in May, the least 1·0 in April and August ; the average for the year is 2·0. These figures refer to the 9 a.m. observations only. To explain the peculiar nature

of the wind directions it is necessary to realize that immediately to the north and west of the town the slopes of Kenya begin, while to the south and east there is open country. The records are short. As far as they go they indicate that the wind is exclusively from the east from January to May, in June the predominant wind is east with about 25 per cent. of south-east. In July the winds are about equally distributed between south and east; in August we have again predominant east with some south-east wind; in September the wind is exclusively east, while from October to December east and south winds only, the east predominating, are recorded at Fort Hall. Thus it is inferred that the north and west winds seem completely shut off by the mountains.

Equatorial Plateau. Nandi, Eldama Ravine, Naivasha

The stations at Nandi, alt. 6,600 ft., Eldama ravine, alt. 7,240 ft., and Naivasha, alt. 6,350 ft., give us some insight into the climate of the important part of the plateau which forms the south of the Naivasha province, but of the northern part, the Baringo and Laikipia district, little is known apart from rainfall from the climatic point of view. On the plateau of Laikipia, Von Höhnelt recounts that violent north-east winds were encountered which blew down from the plateau on the hot slopes below. This was especially the case east of Lake Baringo where these winds blew with gale force during the early hours of the night. The whole region he reports to be very dry except the high mountainous parts.

The mean temperatures at Eldama ravine, Nandi, and Naivasha taking them in descending order of altitude are for the year 60.2° F., 64.7° F., and 62.8° F., their highest values being 62.2° F. in April, 67.0° F. (January, February, and March), and 64.8° F. (January), those of Nandi being exceptionally high. The mean daily maxima are 76.4° F., 79.6° F. and 82.2° F. in March, January, and February respectively; the mean monthly maxima are 82.5° F., 87.0° F. and 85.8° F. in March, January, and February respectively.

The mean daily minima are 43.1° F. in October, 51.2° F. in September, and 45.4° F. in August; the mean monthly minima 36.5° F. in October, 47.1° F. in December, and 42.2° F. in June. The maximum extremes are 90.0° F. in March, 101.0° F. in January and 89.0° F. in November. The minimum extremes 30.0° F. in September, October, November, and December, 39° F. in July and 40.0° F. in March and June, showing that the climate at Nandi is warm for its altitude.

The range of temperature at Eldama ravine is great, varying between 43.5° F. in October and 35.6° F. in May; at Nandi the range varies between 37° F. and 28.8° F.; at Naivasha, where the range is greatest, it varies from 43.4° F. in January to 36° F. in August. The mean annual rainfall at Eldama ravine is 42.74 in., at Nandi 69.10 in., at Naivasha only 30.92 in., and at Baringo in the north 28.98 in. At Nandi May is the rainiest month, but at Naivasha, Eldama, and Baringo the wettest month is April. The beginning of the year in this district is comparatively dry, but rain falls in every month. There is no secondary maximum at Nandi but there is considerable rainfall in every month from March to October, the monthly average being from 7 to 8 in.; in the dry season, November to February, the monthly average is from 2 to 3 in. Beyond Nandi the descending slopes become arid until the land is watered again by the moist lake winds. Taking the district as a whole 12 per cent. of the total rainfall occurs in the months December, January, and February; from March to May 36 per cent. is recorded; from June to August the percentage is as high as 32 as compared with about 8.5 per cent. for the same months in the Kikuyu-Limoru district, while from September to November the balance of 20 per cent. is precipitated. It will be noted from the following statement that notwithstanding the great diversity in the amounts of rainfall recorded at each place the percentages representing the proportion of the total fall precipitated at each period are extremely uniform :

	<i>Seasonal rainfall in inches.</i>					<i>Percentage of total rainfall.</i>			
	<i>Dec.-</i>	<i>Mar.-</i>	<i>June-</i>	<i>Sept.-</i>	<i>Total.</i>	<i>Period.</i>			
	<i>Feb.</i>	<i>May.</i>	<i>Aug.</i>	<i>Dec.</i>		<i>A.</i>	<i>B.</i>	<i>C.</i>	<i>D.</i>
Baringo	2.83	9.79	10.73	5.63	28.98	10	34	37	19
Nandi	8.01	23.30	22.77	15.02	69.10	11	34	33	22
Eldama									
Ravine	5.18	15.48	14.10	7.98	41.74	12	36	33	19
Naivasha	4.40	12.42	7.52	6.58	30.92	14	40	24.5	21.5

So far as Baringo, Nandi, Eldama ravine are concerned the mean fluctuation from the normal rainfall from year to year is not more than 13 per cent., but at Naivasha the fluctuations during the period 1906-16 have varied between +80 per cent. and -67 per cent., while the unreliability of the rainfall at this place will be deduced from the fact that the mean fluctuation for eleven years was as much as 34 per cent.

PERCENTAGE OF FLUCTUATION FROM THE NORMAL

	1916.	1915.	1914.	1913.	1912.	1911.
Baringo	—	—	—	-15	+20	+3
Nandi	+21	-21	+4	-5	0	-17
Eldama Ravine	+30	+2	+21	-6	+11	-13
Naivasha	+18	-35	-30	-24	+9	-6

	1910.	1909.	1908.	1907.	1906.	<i>Mean fluctua- tions.</i>
Baringo	-18	0	+29	-7	-10	±12.8
Nandi	-5	-12	+5	-27	+7	±11.3
Eldama Ravine	-12	+9	+2	+28	+25	±14.4
Naivasha	-67	-29	+80	+67	+12	±34.4

Two years' records are available for the station of Kabarnet, a post on the Kamasia range at an altitude of approximately 7,000 ft. to the west of Lake Baringo. The data afforded shows that the rainfall of about 72 in. attains a maximum of 12.84 in. in June and a minimum of 1.32 in. in December and that the amount of rain and percentage of the total fall for each of the four periods of the year are as follows: December to February 4.82 in. (7 per cent.), March to May 25.45 in. (35 per cent.), June to August 28.80 in. (40 per cent.), and September to November 13.23 in. (18 per cent.).

Farther west in the Uasin Gishu district is the station Eldoret (lat. $0^{\circ} 31' N.$, long. $35^{\circ} 16' E.$) for which seven years' rainfall statistics are available. The mean rainfall at this station, which is situated at an altitude of 6,842 ft., is 42.75 in. of which nearly half (46 per cent.) is precipitated in the three months June, July, and August. The month of minimum rainfall is December with 0.76 in.; from this month onwards the rainfall increases uniformly until the maximum (7.00 in.) is attained in July after which it decreases until October when the mean fall is 1.82 in. There is the suggestion of a slight increase in the November rainfall (2.52 in.), but the normal for that month is weighted by a heavy rainfall of 6.69 in. in 1911, omitting which the mean would be the same as for October. The mean fluctuation from the normal year by year amounts to about 20 per cent. and in the course of 7 years from 1910 to 1916 varied between +36 per cent. in 1916 and -47 per cent. in 1911. The percentage of the total fall precipitated in each month, and the maximum or minimum recorded for 1915-16 at Kabarnet and for 1910-16 at Eldoret are as follows :

		<i>Jan.</i>	<i>Feb.</i>	<i>Mar.</i>	<i>April.</i>	<i>May.</i>	<i>June.</i>
		%	%	%	%	%	%
Kabarnet	. . .	3	2	7.5	11.5	16.5	18
Eldoret	. . .	2	4.5	5.5	9	10.5	15
<i>Max. fall in inches.</i>							
Kabarnet	. . .	3.99	2.7	7.35	9.57	12.57	18.16
Eldoret	. . .	4.18	4.75	3.86	5.19	8.82	9.30
<i>Min. fall in inches.</i>							
Kabarnet	. . .	0.0	0.3	3.25	7.23	10.92	7.52
Eldoret	. . .	0.0	0.0	0.98	1.20	0.84	2.95
	<i>July.</i>	<i>Aug.</i>	<i>Sept.</i>	<i>Oct.</i>	<i>Nov.</i>	<i>Dec.</i>	<i>Year.</i>
	%	%	%	%	%	%	%
Kabarnet	. 10.5	11	10	2.5	5.5	2	100
Eldoret	. 16	15	10.5	4.5	6	1.5	100
<i>Max. fall in inches.</i>							
Kabarnet	. 9.72	13.99	13.42	2.04	4.8	2.17	80.84
Eldoret	. 13.14	11.81	9.8	3.94	6.69	2.59	58.02
<i>Min. fall in inches.</i>							
Kabarnet	. 5.55	2.68	1.42	1.45	3.24	0.47	63.41
Eldoret	. 0.0	2.96	1.34	0.3	0.5	0.0	22.65

The mean number of rain days at Eldama ravine, Nandi, and Naivasha is given as 163, 155, and 91 respectively, which show that the density of rain is much the greatest at Nandi, where oddly enough August has the greatest number of rain days. Hail occurs at Nandi on the average on seven days in the year, at Eldama on two. The mean number of thunderstorms at Eldama ravine is very great, being 116; from April to August there are said to be on the average 14 per month. At Nandi the expectation is 49 for the year, 8 of which occur in April. At Naivasha the mean is 76 for the year. Thunderstorms here are especially prevalent from August to October.

Cloudiness (9 a.m. observation) at Nandi is greatest in May (5.3); the period from February to August furnishes most cloud in the morning, the average being 3.2, whereas the drier months from September to January have the low average of 1.1. At Eldama ravine maximum cloudiness (at 9 a.m.) is in July (3.5), the average for the year is 2.5, while the minimum (1.3) occurs in January.

No wind results are available at Nandi, but at Eldama ravine the average wind force at 9 a.m. is taken and gives a mean for the year of 2.1, the highest force being attained in November, which has a mean of 2.8. At Naivasha the average wind force for the year (1.3) is much lower, the highest value being that of October with 1.9. At Eldama ravine throughout the year the east wind is dominant forming from 70 to 91 per cent. of the total number of winds recorded. In the summer and autumn occasional north, south, and west winds are recorded, but in no case do winds from these quarters amount to more than 10 per cent. each, and they reach that standard on rare occasions. In the early months of the year there are about 10 per cent. of calms. At Naivasha quite different conditions prevail. From January to March north-west winds are dominant with calms 23 per cent., 57 per cent., and 81 per cent. in the three months. In April the calms diminish to 45 per cent. and the wind turns to the south. From May to August calms are negligible and

constant south-west winds, with occasional south and west winds, prevail, which in September and October turn to south-east and dominant south winds. In November the winds blow from the quadrant east to south, which change to south-west and west winds in December, a transition state to the north-west winds of the early part of the year. The distinctive features of the wind direction at Eldama ravine and Naivasha can be readily determined from the following table that shows the percentage of winds blowing from each quadrant at four periods of the year.

December-January-February

	N.	E.	S.	W.	C.
Eldama Ravine	4	89	2	0	5
Naivasha	15.5	5	21	30.5	28

March-April-May

	N.	E.	S.	W.	C.
Eldama Ravine	2.5	85	2	2.5	8
Naivasha	3	0.5	34	19.5	43

June-July August

	N.	E.	S.	W.	C.
Eldama Ravine	4	86.5	5.5	2	2
Naivasha	0	0	47.5	52.5	0

September-October-November

	N.	E.	S.	W.	C.
Eldama Ravine	9	75	7.5	5.5	3
Naivasha	1	16	78	5	0

Year

	N.	E.	S.	W.	C.
Eldama Ravine	5	84	4	2.5	4.5
Naivasha	5	5.5	45	26.5	18

Equatorial Plateau. Sotik

In the Nyanza Province, including S. Kavirondo, only rainfall reports exist, except at Sotik, and these and the records of travellers are relied upon for the remarks that follow. With the exception of the one port, Karungu, the low-lying unhealthy parts of the province near the lake have been to a great extent abandoned by the inhabitants for higher levels. At Sotik, in the centre of the province (alt. 6,300 ft.), a short sequence of observations are available. These show that the mean temperature varies but little

throughout the year, the highest monthly mean being 66.2° F. in September, the lowest 63.0° F. in November, while the mean of the year, 64.7° F., is the same as at Nandi. The highest mean daily and monthly maxima are 85.7° F. and 92.3° F. in January. The lowest mean daily and monthly minima are 42.2° F. and 33.3° F., also in January. As might be expected therefore the range of temperature in January is very high and reaches 59° F., as compared with a minimum in June of 39° F.

The amount of rainfall precipitated in this district at four periods of the year and the percentage of the total fall is given in the table that follows. The most striking feature, perhaps, of this statement is the fact that the December to February percentage of the year's rainfall at Sotik is so high. It is also remarkable that the June to August percentages at Lumbwa and Molo should be as high as 33–35 per cent. The secondary rainfall (5.0 in. in November at Sotik, 7.02 in. in September at Kisii) is clearly defined in the case of the more southerly stations, but there is no indication of a secondary fall in the north of the province :

	<i>Seasonal rainfall in inches.</i>					<i>Percentage of total rainfall</i>			
	<i>Dec.-</i>	<i>Mar.-</i>	<i>June-</i>	<i>Sept.-</i>	<i>Total.</i>	<i>Period.</i>			
	<i>Feb.</i>	<i>May.</i>	<i>Aug.</i>	<i>Nov.</i>		<i>A.</i>	<i>B.</i>	<i>C.</i>	<i>D.</i>
	<i>A.</i>	<i>B.</i>	<i>C.</i>	<i>D.</i>					
Lumbwa	6.61	20.71	18.27	9.46	55	12	37.5	33.5	17
Molo	7.17	20.02	20.94	12.36	60.5	12	33	35	20
Kericho	9.81	24.97	19.54	17.69	72	13.5	35	27	24.5
Kisii	9.76	26.59	15.11	19.05	70.5	14	38	21	27
Sotik	11.43	18.99	9.26	11.04	51	22.5	37.5	18	22
<i>Mean.</i>	8.96	22.26	16.62	13.92	61.8	15	36	27	22

It is interesting to note that the December to February rainfall at Sotik is 73 per cent. greater than at Lumbwa, while the Lumbwa June to August fall is practically double that of Sotik for the corresponding period : it is also noteworthy that on an average Kisii receives twice as much rain as Lumbwa in the three months September to November.

The mean fluctuation of the rainfall year by year from the normal is not high, ranging as it does from 8 to 17 per cent.,

indicating that the rainfall has the merit of regularity. It will be noted from the following statement that the percentage of fluctuation varies considerably, however, among the stations for the same years; thus in 1907 there was a deficiency of 5 per cent. at Molo and 17 per cent. at Kericho, and a surplus at Lumbwa of 55 per cent. :

FLUCTUATION PER CENT. OF RAINFALL FROM THE NORMAL

		1916.	1915.	1914.	1913.	1912.	1911.	
Lumbwa	. .	0	—22	—10	—5	—8	—35	
Molo	. .	+13	—18	—6	—12	+4	—22	
Kericho	. .	+14	+11	+4	—10	—1	—11	
Kisii	. .	+9	+10	+7	—5	—4	—13	
Sotik	. .	+1	—7	+1	+13	+16	—23	
		1910.	1909.	1908.	1907.	1906.	1905.	Mean.
Lumbwa		—5	+18	—12	+55	+30	—4	±17
Molo	. .	+6	+32	—26	—5	—1	+39	±15
Kericho		+1	—25	+12	—17	—1	+22	±11
Kisii	. .	—	—	—	—	—	—	±8
Sotik	. .	—	—	—	—	—	—	+10

At Kisii nearest the coast the average rainfall for six years was 70·51 in., with maximum of 9-10 inches precipitation in April and May; a very dry January and rainfall varying between 3 and 6 in. in the remaining months are characteristic of this station. In the north-east, or Lumbwa district, rainfall records at Kericho for a dozen years are available, and at Lumbwa and Molo Stations on the railway for twelve and thirteen years respectively. At Kericho the mean rainfall for the year is high, 72·01 in.; the maximum 9·78 in. occurs in April, and the minimum, 2·45 in., in January, while considerable precipitation is manifest in all the other months. On the part of the railway between Lumbwa and Molo the rainfall is rather less. At Lumbwa the mean rainfall for the year is 55·15 in.; and the mean maximum of 8·86 in. occurs in April. From October to February the rainfall is 1-3 in. per month, for the other months the mean precipitation is 5·8 in.

At Molo the mean fall for the year is 60·5 in., the maximum monthly mean (9·23 in.) occurs in April, the minimum 1·85 in. in January. There is here a second maximum of 8·8 in. in August. The maximum monthly precipitations recorded are

25·2 in. for August, and 19·99 in. for April, but heavy rains may occur at times in any month.

The mean rainfall at Sotik is 50·72 in. per annum, April being the rainiest month with a mean of 7·86 in., and July the driest, with a mean of 2·33 in. ; steady rainfall is registered in all the other months. The number of rain days is very great, 189 in the year ; the average rain density therefore, 0·268 in., is not great. The greatest rainfall occurring in any month during the period 1910–16 at this station was 10·91 in. in April 1913, while for the same period the wettest year was 1912, with 59·26 in. The greatest fall in twenty-four hours recorded from 1911 to 1913 was 2·35 in. in February 1913, but practically every month during these three years experienced a rainfall of one inch or more in a day. The modest aggregate of four days of hail may be expected in the year at Sotik, but the mean number of thunderstorms, judging from the records of three years, is very great, the mean for the year being no less than 214. In April there were on an average 29 days of thunder, practically every day in the month. January and July, each with 8, are freest of thunderstorms, but all the remaining months have the high average per month of 19 days of thunder.

Victoria Nyanza District. Kisumu

For the Kisumu district the climatic observations at Kisumu (Port Florence) are available as well as the rainfall measurements at stations on the railway near there which will be useful for comparison. Kisumu is on the level of Lake Victoria, with an altitude of 3,700 ft. The mean temperature is highest in March (75·6° F.) and lowest in July (72·2° F.), with a mean annual value of 73·9° F., the values forming a sort of mean between those of the plateau and the sea-coast. The mean daily and monthly maxima are highest in March and February, with values 86·2° F. and 94·5° F., while the mean daily and monthly minima are both lowest in August and have values 61·5° F. and 58·1° F. respectively. The extreme absolute maximum and minimum values are 110° F. in

February, and 45° F. in January. The range of temperature is high, varying between 34·9° F. in February and 25·5° F. in June, but not so high as on the plateau. The mean rainfall at Kisumu itself is 46·75 in., which is distributed over the whole year; the maximum, 7·22 in., occurs in April, the minimum, 2·15 in., in July. January is also a dry month with a mean fall of 2·30 in. Inland, about 30 miles north-west of Kisumu, is Mumias (4,332 ft.), where the rainfall is far heavier, 71·0 in., with a fall of 10·09 in. in April and 8·95 in May, and steady precipitation in all the other months, January being again driest with a mean fall of 2·43 in. Due east, at about the same distance, on the railway lies Muhoroni (alt. 4,140 ft. approximately), where the mean rainfall is still higher, being 72·84 in. for the year, with a maximum, in April, of 11·57 in., and a steady rainfall throughout the year, having its mean minimum of 2·67 in. in January.

At Kibos (3,650 ft.), the next station to Kisumu on the line, the mean rainfall is, for 7 years' record, 43·97 in., slightly less than at Kisumu.

At Kisii (alt. 4,400 ft. approx.), which lies about as far to the south of Kisumu as Mumias is situated to the north-west, the annual rainfall is 70·5 in., of which 18·84 in. are fairly evenly divided over April and May and the month of least precipitation is January, with 1·6 in. As will be noted from the following table the majority of stations in this neighbourhood have their season of maximum rainfall from March to May, and but little indication of a secondary rainfall in the autumn, but at Kisii there is a marked difference in the rainfall of the period June to August, and that of September to November, the latter being some 4 in. more in quantity, or 26 per cent. The fact that the Lake Uvel stations give an average of about 46 in. of rainfall per annum, while those stations above and away from the lake experience 70 in. or more shows that to the north and east ascensional rain falls when the moist winds reach the higher ground surrounding the lake, thus greatly increasing precipitation at these stations.

<i>Seasonal rainfall in inches.</i>						<i>Percentage of total rainfall.</i>			
	<i>Dec.- Feb.</i>	<i>Mar.- May.</i>	<i>June- Aug.</i>	<i>Sept.- Nov.</i>	<i>Total.</i>	<i>Period.</i>			
	<i>A.</i>	<i>B.</i>	<i>C.</i>	<i>D.</i>		<i>A.</i>	<i>B.</i>	<i>C.</i>	<i>D.</i>
Mumias .	10.55	24.25	18.86	17.34	71	15	34	26.5	24.5
Kisumu .	10.71	18.77	9.38	7.89	47	23	40	20	17
Kibos .	7.81	19.06	9.21	7.89	44	18	43	21	18
Muhoroni .	14.16	24.27	16.89	17.52	73	20	33	23	24
Homa Bay	10.31	16.40	13.15	6.99	47	22	35	28	15
Kisii .	9.76	26.59	15.11	19.05	70.5	14	38	21	27
<i>Mean</i> .	10.55	21.56	13.77	12.78	58.7	18.5	37	23.5	21

The average number of rain days at Kisumu is 117.

No wind records are available, but the usual violent storms of wind and rain are said to prevail near and on the lake in the afternoon during the rainy months.

Victoria Lake

The climate near the lake of Victoria Nyanza differs from that of the rest of East Africa in many ways and again that of the east side differs from that of the west. In order to arrive at definite conclusions the results at stations must be taken which do not actually lie in British East Africa, such as Entebbe, Uganda, Rubja, and Bukoba on the west coast of what was German East Africa, Muanza, Neuwied, on the south side of the lake, and Shirati on the former frontier of British and German East Africa.

Lake winds.—As is the case with every great water surface the warmth of the day and radiation at night cause a regular flow of lake winds by day and land winds by night, so that on the eastern and western, as well as on the northern and southern sides, these winds blow in opposite directions. Superimpose the prevailing south-east trade wind, blowing now gently and at other times strongly, and a great variety of air currents result. Thus, for example, the wind blowing from the lake towards the south and east shores opposes the trade wind and weakens it, on the north and west shores, the wind that blows from the lake combines with the trade wind, and the two blowing conjointly produce strong winds which,

especially in the rainy season, culminate in heavy gales which compel the fishermen to seek shelter in shore. Thus the north and west coasts are stormy and wet, while on the east and south-east shore land winds prevail, which having blown over dry steppes bring with them little moisture with the corollary that by July the vegetation on this coast disappears and the country becomes arid. On the other hand, on the north and west side, the south-east wind, having gathered up moisture during its passage across the lake causes abundant rainfall and a luxuriant tropical vegetation.

To the south-west of Lake Victoria the district of Usindja has a certain amount of true growth, and that of Usui is a rainy mountainous country. On the south-west shore the district of Ihangiro is a country of open alpine pastures of considerable altitude, the normal weather of which appears to have as its characteristic a clear early morning, followed between 9 hr. and 10 hr., by the arrival of heavy clouds from off the lake, which discharge copious rains in the early afternoon, the evening becoming bright again.

The fertilizing influence of the lake, however, does not extend far west, because at Karagwe, at a height of 4,900 ft., there is an arid desert. Away to the north-west, about 150 miles from the lake, lies the mighty mountain range of Ruwenzori, the greatest glacier region in equatorial Africa where the snowline varies between 10,000 ft. and 13,000 ft., according to season. Here it rains all the year round. The range is almost continuously cloud-covered and the mountains invisible for months at a time. Travellers say that occasionally at sunrise or sunset the sky is clear for a short time.

Lake Levels.—There are three variations in the level of the lake, annual, periodic, and secular.

In the rainy season the precipitation carried down by the tributaries and the fall into the lake itself cause it to rise on the average about 1–2 ft., though sometimes the rise is much more. The periodic change seems to depend on the periodic intensity range of the rainfall. Similar changes have been noted in the other great lakes. From 1878, the last maximum

height, the level declined till 1892. From 1892 to 1895 there was a rise, then another decline, owing to diminished rainfall till 1901. From 1906, when the average mean level was 2 ft. 4.4 in. above the datum (3,726.15 ft.) the fall was almost continuous for several years, and for the year 1913 the observers at Port Florence report that it was 2.91 in. below zero. The secular variation seems to indicate that the lake is gradually drying out, a probability that is emphasized by the fact that at certain places lacustrine sand deposits may be seen 60 ft. or more above the present level of the lake. Daily variations in level at Port Florence, which may rise to 6 ft. above the ordinary level, are caused by the strong lake wind. The annual maximum level is reached in May or June after the heavy April rains. This rise is succeeded by a rapid fall, because the south-east trade wind blows hot and dry in the summer, causing very intense evaporation. Should the November rains be slight the level of the lake will sink till the next April. The outflow at the Ripon falls has been calculated to lower the level of the lake only about an inch per month. But as the mean fall from June to April may vary between 2 and 16 ft., it is evident that evaporation is the more powerful factor in diminishing the level.

Tides.—The regular change of wind produces seeming tides in the lake; thus the prevailing south-east air currents cause on the western side currents that run from south to north, which, for example, dam up the waters of the Kagera river which flows into the lake north of Bukoba. In the rainy season the strong gales accompanied by thunderstorms, and sometimes by waterspouts, raise a heavy sea. Waves 7 ft. high and from 30 ft. to 60 ft. in length then give the lake an appearance of open sea, and seaworthy vessels are required to navigate it.

Temperature is very uniform, and the mean temperatures of the warmest and coolest months do not differ from the lake district as a whole by much more than 3° F. When comparison is made between the east and west coasts it is found that the mean temperature is higher on the eastern than the western side of the lake. Thus the mean average of four stations on

the eastern side gives 72·9° F., or 4·2° F. higher than the mean average of four stations on the western shore. If the comparison is carried farther it is found that the highest mean daily maximum temperature for the eastern stations (86·1° F.) is 7·2° F. higher than that of the four western stations, that the corresponding data in respect to the highest mean monthly maxima are 92·9° F. for the east and 84·1° F. for the west, and that whereas an absolute maximum of 100·2° F. has been recorded for the eastern stations, the highest temperature registered on the west coast was only 89° F. These particulars show how much hotter the eastern shore is than the western ; not only in average temperatures but in extremes. As regards the lowest temperatures there is very little difference, as the following comparison of the means of four eastern and four western stations shows :

	<i>East.</i> ° F.	<i>West.</i> ° F.
Lowest mean daily minimum	60·7	60·1
Lowest mean monthly minimum	56·9	56·4
Absolute minimum	49·7	50·7

The above statement indicates, therefore, that it cannot be said that the night temperature of one side of the lake is appreciably cooler than that of the other.

The mean rainfall for the Victoria Nyanza district amounts to 55 in. per annum, of which amount 21½ per cent. falls in the period December to February, 41½ per cent. from March to May, 14½ per cent. in the dry months, June to August, and 22½ per cent. in the autumnal months, September to November. The principal rainy season for the district is March, April and May, and particularly during the two latter months, while there is a secondary wet period in November and December. The proportion of the total rainfall precipitated in each month and the amount is as follows :

	<i>Jan.</i>	<i>Feb.</i>	<i>Mar.</i>	<i>April.</i>	<i>May.</i>	<i>June.</i>	
Rainfall, inches	3·0	3·6	5·8	10·6	6·7	2·8	
Per cent. of total fall	5·5	6·5	10·5	19·0	12·2	5·0	.....
	<i>July.</i>	<i>Aug.</i>	<i>Sept.</i>	<i>Oct.</i>	<i>Nov.</i>	<i>Dec.</i>	<i>Year.</i>
Rainfall, inches	1·9	3·2	2·8	3·7	5·9	5·2	55·2
Per cent. of total fall	3·5	6·0	5·0	6·5	11·0	9·5	100

Omitting Mengo and Mumias, respecting which there is very little data, it is found that the mean number of rain days, 115 per annum for the whole area, varies between 76 (Shirati) and 145 at Neuwied. This very considerable divergence in the number of rain days suggests the probability of a lack of unanimity in the rain density, and it is indeed found that the density varies between 0.68 in. at Rubja and 0.35 in. at Shirati. In point of fact the amount of rain precipitated per rain day varies according as to whether the station is situated east or west of long. 33°. If it lies to the east of long. 33° the density is low, if to the west it is high :

<i>West.</i>			<i>East.</i>		
	<i>Altitude in feet.</i>	<i>Mean density. in inches.</i>		<i>Altitude in feet.</i>	<i>Mean density in inches.</i>
Rubja .	4,658	0.68	Kisumu .	3,700	0.39
Bukoba .	3,723	0.56	Neuwied .	3,956	0.36
Muansa .	3,739	0.46	Shirati .	3,822	0.35
Entebbe .	3,842	0.43			

Some very heavy monthly rainfalls have been recorded in the Nyanza district : thus at Bukoba in April 1895 30 in. were precipitated, or considerably more than an entire year's fall at many British stations ; at Muansa in November 1902, 24 in. fell in the month, while at Mumias in April 1909 a total fall of over 21 in. was recorded. Data respecting heavy rainfalls in twenty-four hours are somewhat meagre, but it is interesting to note that both at Bukoba and Neuwied 5 in. of rain have been measured in one day, while other stations have registered from 2.8 in. to 3.8 in. in twenty-four consecutive hours.

To compare the rainfall between the eastern and western stations the mean of four stations on each side has been taken. The mean rainfall on the eastern side is 46.5 in. per annum, on the western 65.6 in. This does not imply that there are no stations on the western side with deficient rainfall ; but in the main the west side is the wetter and has the greater number of rain days, an average of 126 compared with 109 on the other side. These climatic changes, notably the increase of precipitation from east to west, get expression in the vegetation of the lake area. Kavirondo has already been

described. From Shirati to Muansa there are no trees but grassland. Only the western part of the island Ukerewe is covered with forest trees. Eastward of Speke Gulf there are broad grass steppes, which change to the thorn scrub and tree steppes of the West Massai country. On the south and east shores the muddy mouths of the rivers and brooks are choked with papyrus growths over 10 ft. high, filled with hordes of mosquitoes and other stinging flies. South of the Speke Gulf, in Ussukuma, the steppes are grass covered with bushes and isolated trees. Proceeding westward to Usindja past the Emin Pasha Gulf, dense forests of ash-like trees (Miombo) are met with, while the high alpine pasture-land of Ihangiro gives place to the flora of the humid west coast, where high grasses alternating with tropical forests of luxuriant growth cover most of the west and north of the lake in Buddu and Uganda.

The *cloud* values of the lake area vary between 3·4 at Muansa, a comparatively low mean, and 7·1 at Neuwied, less than 40 miles away, the latter value being the highest recorded at any station in the Protectorate itself or in its vicinity. At Neuwied in April and November the monthly mean reaches 8·0 and over, while it is never less than 6·0 in July. The diurnal variation at this place is very marked : at 7 a.m. the mean value for the year is 8·3 (maximum 9·1 in April and minimum 6·9 in July ; at 2 p.m. the atmosphere is about 9 per cent. more clear, that is to say, 7·6 on the scale 0·10, with the exception of the months July, August, September, and October, when there is practically no variation in the mean of the morning and afternoon observations. By 9 p.m. the sky has cleared considerably, but that the cloud value is still great as compared with neighbouring stations will be gathered from the fact that the mean of the year is as high as 5·5 (maximum 7·2 in November, minimum 3·9 in June). Taking the lake area as a whole the mean cloud values month by month are as follows :

<i>Jan.</i>	<i>Feb.</i>	<i>Mar.</i>	<i>April.</i>	<i>May.</i>	<i>June.</i>	<i>July.</i>	<i>Aug.</i>	<i>Sept.</i>	<i>Oct.</i>	<i>Nov.</i>	<i>Dec.</i>	<i>Year.</i>
5·2	5·3	5·8	6·1	5·3	4·8	4·6	5·2	5·1	5·8	6·0	5·1	5·4

Thus it is seen the maximum is attained in April and the minimum in July, while a secondary maximum coincides with the secondary rainy season in October to November. The mean cloud value for the year coincides with that of the 8 a.m. observation at Yarmouth, but is considerably less than the average 8 a.m. observation at Scilly (7.5) or Dover (6.2).

The mean *relative humidity* of this district, taking it as a whole, is 76 per cent., with a maximum of 84 per cent. in April and a minimum of 67 per cent. in July. At Bukoba, on the west and rainy side of the lake, the maximum in April is 89 per cent., while at Neuwied at the south-east, a minimum of 64 per cent. is attained in July: these extremes appear to be the highest and lowest normals for this part of the world. The diurnal variation is considerable: at Neuwied, for example, the yearly mean for the 7 a.m. observation is 80.6 per cent., at 2 p.m. it is only 57 per cent., while at 9 p.m. it has again risen to over 80 per cent. (81.3 per cent.). How the mean relative humidity at Neuwied compares with that of the district as a whole is set forth in the following statement which also gives the value at hours of observation, and the mean and absolute minimum at the same station at 2 p.m.:

RELATIVE HUMIDITY

Mean of the day :	Jan.	Feb.	Mar.	April.	May.	June.
Nyanza District	77	76	79	84	79	70
Neuwied	75	76	75	81	75	67
7 a.m. at Neuwied	83	84	84	88	84	78
2 p.m. „	60	61	59	68	58	49
9 p.m. „	83	82	83	87	82	75
Mean minimum at 2 p.m.	35	40	38	50	43	37
Absolute minimum	24	28	28	43	35	29

Mean of the day :	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Nyanza District	67	73	73	75	79	80	76
Neuwied	64	71	68	71	75	77	73
7 a.m. at Neuwied	74	77	73	76	81	83	81
2 p.m. „	46	55	51	54	61	64	57
9 p.m. „	71	80	80	82	84	85	81
Mean minimum at 2 p.m.	32	33	30	32	38	43	38
Absolute minimum	23	25	23	22	31	36	22

Wind observations are few and not very reliable. Some numerical data are now given in addition to the general theory

stated above. The mean wind strength on the lake is 1·9 (scale 1-10), and varies only slightly from month to month. The diurnal variation, however, is great. At Entebbe the mean annual wind strength at 7 hr. is 2·42 miles per hour, at 14 hr. 2·70 miles per hour, and at 21 hr. 2·36 miles per hour; at Neuwied on the scale 0·10 the mean annual wind strength at 7 hr. is 2·20 miles per hour, at 14 hr. 2·92 miles per hour, and at 21 hr. 1·6 miles per hour.

These statistics show that the wind gains strength as the heat of the day increases, and loses strength when temperature becomes cooler at sundown.

At Entebbe throughout the year calms are frequent, and form 46 per cent. of recorded observations. The winds blow almost entirely throughout the year from the directions south 15·7 per cent., south-west 13·6 per cent., and west 15·8 per cent., these percentages aggregate 45·1 and with the calms account for over 91 per cent. of the observations. At Bukoba the prevailing winds blow throughout the year from the quarter east to south, east 24 per cent., south-east 15 per cent., south 13 per cent., total 52 per cent., there being 19 per cent. of calm days. Sporadic northerly and westerly winds are, however, not uncommon at Muansa situated on the north-east coast of Smith's Sound. As might be expected from its position, south-east to south-west winds (south-east 16 per cent. south 14·5 per cent., south-west 12 per cent.) are the most frequent, while of the balance of 57·5 per cent. the west and north-west winds account for 21 per cent., and there are 20 per cent. of calms.

For further information respecting stations on the west coast of Lake Victoria the reader is referred to the handbook dealing with the Uganda Protectorate.

CHAPTER IV

VEGETATION

General—Tropical coast—Nyika—Savannah—Highland Forest—
Moorland—Synopsis of Forest Rules.

GENERAL

SINCE the East African Protectorate ranges in altitude from sea-level to 17,000 ft., and in humidity from the desert conditions of the Rudolf district, where rain may fail for several consecutive years, to the cold and wet of Mau forest, where it falls for nine months of the year, the vegetation exhibits considerable diversity. The narrow coastal plain, with a high temperature and sufficient rainfall, is characterized by mangrove swamps, and plantations of coconut palms. The arid lowlands or nyika, below 3,000 ft. in altitude, have an East African flora, approximating in the north to that of Somaliland. In this region, occupying about two-thirds of the Protectorate, the rains are short, and during most of the year the country is a desert steppe. Thorn bush covers a large part of the surface, forming in many places vast and dense thickets which offer a serious obstacle to all transport. The characteristic trees are the giant euphorbia or mukarara, baobab or mbuyo, and flat-topped acacia. A richer vegetation borders the water-courses and swamps, many of which are dry during the greater part of the year. To the west and north-west this steppe merges into the highland savannah zone, comprising the open grass plains, downs, and parkland between 3,200 and 9,000 ft. above the sea. In this savannah zone, which includes the floor of the Rift Valley, the Athi, Kapiti, and Loita plains, the greater part of the Kavirondo country, and the Uasin Gishu and Laikipia plateaux, the best arable and grazing land is found. It is therefore the chief area of settlement. The

ground is thickly covered with a rich growth of grass, which is perennial above the 7,000 ft. line, and dotted with trees and bush, forming in some districts considerable open woods and thickets. Papyrus swamps occur in the moist depressions, and acacia forest borders the water-courses.

The dense tropical forest of the Congo type found on the lower savannah and lake shores in Uganda hardly extends into this Protectorate. The East African forests are, with the exception of a few isolated patches on the coastal belt and in Nyanza Province, almost exclusively highland in character, and closely related to the evergreen forest of South Africa. They clothe the slopes of Kenya, Elgon, and the Aberdares, and the western escarpments of the Rift Valley, ranging in altitude between 6,000 and 10,000 ft. They are of two kinds: 'wet forest', usually found on eastern and south-eastern slopes, which receive a heavy rainfall up to 120 in. or more; and 'dry forest', generally on western slopes. In the wet forest the giant camphor trees, yellow-wood, and large hard-wood trees are chiefly found. In the dry forest—a term only to be understood in a relative sense—the dominant species is the African cedar, which, on account of its abundance and easy regeneration, is one of the most valuable indigenous timber-trees of the Protectorate. The estimated area of the highland forests is about two million acres. As intensive water-condensing areas, their preservation is of the highest importance, and is the key to the continued fertility of the whole highland zone. The chief forests are now reserved to the State; the total area already demarcated and proclaimed amounting in 1915 to 1,378·55 square miles. Stringent rules under the Forests Ordinance prohibit the felling of timber, gathering of forest products, and admission of squatters, grazing of cattle, &c., except under licence. The more valuable trees growing on unproclaimed Crown Lands are also protected (see below). Fuel areas are reserved near the chief townships.

Above the timber-line, which is marked in wet forests by a zone of highland bamboo, ranging from about 8,500 to 10,000 ft. is the so-called moorland or alpine zone. This is an open

waste of boggy soil, supporting a peculiar mountain flora which ranges from the tree-heaths found at 11,000–12,000 ft. to the giant senecios and lobelias which characterize the higher levels of Elgon, Kenya, and the Aberdares (13,000–14,500 ft.).

The country is therefore divisible into five floral zones, conditioned both by altitude and by rainfall :

(a) The tropical coast-zone, stretching south from Lamu to the southern frontier, and inland to an altitude of about 500 ft.

(b) The desert-nyika zone, between the altitudes of 500 and 3,200 ft. This is an almost level steppe comprising all Jubaland and Tanaland, and much of Seyidie and Ukamba Provinces.

(c) The high-savannah zone, between 3,200 and 9,000 ft. above the sea, and mostly lying south of latitude 1° north and west of longitude $38^{\circ} 50'$ east.

(d) The highland forest zone, on the mountains and escarpments between 6,000 and 10,000 ft. above the sea.

(e) The moorland or alpine zone, between 10,000 and 14,500 ft. above the sea.

Indigenous plants of economic value will be treated under Resources.

TROPICAL COAST ZONE

The coastal zone forms a narrow belt, varying from 5 to 20 miles in width, and extending from Lamu to the southern frontier. It consists of a low coral plain, rising inland to an average altitude of 500 ft. Having an unmitigated tropical climate, and a higher rainfall than the nyika which flanks it, it is covered with rich vegetation in the wet season, but at other times much of it is semi-arid in character. Its extent is precisely marked by the groves of coconut palms which flourish from the shore to the summits of the low coastal hills. These, originally imported by Arab settlers, are now naturalized and form the premier resource of the region. A transitional belt of park-like country separates this palm-belt from the nyika. On the Uganda Railway, the width of the coastal

zone is 15 miles, from Mombasa to Mazeras. On the Tana river it extends 20 miles inland. Elsewhere, owing to the narrowing of the coral plain, it is only a few miles in breadth. North of Lamu it vanishes, and the nyika reaches down to the seashore.

The principal plant association is the mangrove (mkoko or kikoko) which forms large dense forests in the tidal swamps and along the muddy banks of rivers and inlets. The chief species are *Rhizophora mucronata* and *Bruguiera gymnorhiza*. The bark of these contains a high percentage of tannin, and the wood, called borities, is in great demand for building, as it resists termites. *Avicennia officinalis*, and *Ceriops candolliana* (mkoko-mkandela) are also common. The wood of the last-named is used for the ribs of dhows. The best mangrove swamps are in the Lamu district. All those between Kimbo Creek in the south and Kiunga in the north, on the islands from Manda to Kiunga Mjuni, and on the banks and foreshore of the Tana at Kipini are now proclaimed forests.

Patches of dense tropical forest, containing large timber trees with boles 50 or 60 ft. in height, are also found in the backlands and foothills of the coastal zone. The most important of these runs south-west from the Sabaki river to the Rare river, parallel to the shore. It is known as the Arabuko and Shikoku (Sekoki) forest, and is 12 square miles in area. On the Shimba hills south of Mombasa are 6 square miles of forest of a more open type, rising to 1,400 ft. above the sea, and another patch crowns the hill of Emwele. In Witu the Utwani forest, said to be well stocked with fine trees, is now only estimated at about 4 square miles. Between these forests are grass plains and stretches of parkland dotted with bush and isolated clumps of trees. The whole is probably the remains of a continuous forest belt which once ran parallel to the coast, and is reported by travellers to extend north-east into the nyika between the rivers Dodori and Durnford.

The most valuable trees in this tropical forest are the sandal-wood or muhugu (*Brachylaena hutchinsti*) which is the principal species at Shikoku, the giant copal tree or mtan-

darusi (*Trachylobium hornimannianum*) and East African teak or mbembakofe (*Afzelia cuanzensis*). The rubber vine mpira (*Landolphia kirkii*) grows freely on the edges of the forest glades, and the mgoa rubber tree (*Mascarenhasia elastica*) on the Shimba hills; but so far neither have proved commercially profitable. An interesting plant found on the Shimba hills is the kweme (*Telfairia pedata*) with cucumber-like fruit 18 to 24 in. long and 8 to 10 in. thick. The fruits contain large edible seeds tasting like Brazil nuts and yielding an excellent bland oil. The plant also occurs in the Taveta district, and is now being cultivated at the Government farm, Kabete. Ebony or mpingu (*Dalbergia melanoxyton*) is widespread through the coastal scrub, but the trees are mostly small and crooked, and are not abundant. Characteristic of the backlands are the dom palm or ivory-nut tree (*Hyphaene coriaceae*) which forms dense groves a few miles inland, and the fan-palm (*Borassus aethiopum*). Both have an edible fruit. That of the dom palm, which tastes like a fibrous ginger-bread, is eaten with impunity by natives, but may cause violent dysentery in those who are unaccustomed to it. The baobab (*Adansonia digitata*) is also common. Its fibrous bark is used in native industries. Another fibre-giving tree of this zone with edible seeds is *Bauhinia reticulata*. The fire-tree (*Erythrina tomentosa*) and flat-topped *Acacia steno-carpa* are general. On sandy soil the bush is often covered with the orchella lichen (*Rocella fuciformis* and *R. tinctoria*) yielding a purple dye. The first is the most valuable. The coastal swamps are beautified by acres of blue water-lilies (*Nymphaea*) and yellow bladder-wort (*Utricularia*).

Exotic plants and trees naturalized in this zone and growing well upon the plain and foothills include the coconut or mnazi (*Cocos nucifera*), tamarind or mkwadju (*Tamarindus indicus*), mango (*Mangifera indica*), custard apple or matomko (*Anona squamosa*), sour-sop or msafeli (*A. muricata*), cashew or kanju (*Anacardium occidentale*), and many sorts of citrus. Sisal (*Agave sisalana*) does fairly well upon the coral rag. For all these, see 'Resources'.

NYIKA ZONE

The desert or nyika zone is a dry steppe with a gentle upward slope from the coast inland, broken here and there by irregular groups of hills. Its few trees and cultivated areas are found mostly on hillsides or near stream beds, and it is chiefly clothed in thorn bush, sometimes scattered but often forming vast and dense thickets from 10 to 20 ft. high, through which a path must be cut with an axe. The nyika embraces the whole country between 500 and 3,200 ft. in altitude: that is to say, Tanaland, Jubaland, Northern Frontier, and Turkana Districts, the greater part of Seyidie, the eastern half of Ukamba, and the country along the southern boundary between longitude 36° east and the coastal plain. In quality it varies from unmitigated desert to dry pasture of the 'low veldt' type. Its earths, whether ferruginous sands or black 'cotton soil', are very fertile, and the general poverty of vegetation is entirely due to lack of moisture. Hence, wherever the steppe conditions are modified—i. e. on hills or round swamps and stream beds—there is a marked enrichment of the flora. Such an interruption is seen in the Taita mountains with their foothills and river valleys, where the rich alluvial earth is either closely cultivated or covered with dense vegetation; in the woods and grass glades of Marsabit; and in the beds of the Tana, Juba and Guaso Nyiro rivers.

Owing to the length of the dry season, when most of the streams fail, the typical nyika plants are all xerophytic. The trees and bushes usually flower just before the short and irregular rains, which occur between April and June. During the rains they produce their leaves and fruit. The country is then, for a brief period, sodden with moisture and covered with a wealth of grasses and flowering herbs; but with the return of dry weather surface water quickly vanishes, grasses wither, trees and bushes shed their leaves, the vegetation becomes dormant, and the whole region is transformed into a brown and desolate steppe.

Thorn-bush is the characteristic plant association. The thickets are mostly composed of small acacias, among which the wait-a-bit bush (*Acacia mellifera*) with its sharp recurved thorns is the most common and vexatious. Several species of *Sansevieria*, the dagger-like leaves of which contain an exploitable fibre, abound. They cover large areas in the Taita district, especially near Voi, and in the arid valleys of the Kyulu range. Other common constituents of the bush are the thorny *Commiphora* bushes, the white-flowered *Grewia populifolia*, and aloes. Scrub vegetation of this type, sometimes 10 or 15 ft. high, covers vast areas of the interior with a dense jungle, excessively trying to all forms of transport. Such a thorn belt fringes the coast from Patta Island to Point Durnford, and is said to extend two days' journey inland. Another extends westwards from the Juba river to Eil Wak.

The open low country in the south-west, such as the Serengeti plain and Nyiri desert, is typical steppe, either bare or lightly bushed. Small grassy plains dotted with euphorbia and acacia trees occur throughout the southern nyika, in regions where decomposed lava forms a fertile soil; but they only form a small proportion of the whole. It is on these plains that the Somali graze their flocks. A marked change of vegetation indicates the places where the water-level is near the surface: i. e. the swampy depressions, water holes, and borders of stream beds, though these are mostly dry during the greater part of the year. A coarse elephant-grass, 10 ft. or more in height, grows in the swamps. Water holes and rivers are fringed by dense belts of reeds, backed by a heavy growth of shrubs, trees, and creepers: principally dom palm, and acacias (*Acacia verugosa* and *A. stenocarpa*).

A riverain forest of this character borders the Tana and Juba rivers, at least for the last 200 miles of their course. The Tana river forest, with an average width of one-fifth of a mile, spreads in many places to a depth of 5 or 6 miles. It is estimated at 25,600 acres. The richest part consists of tropical jungle, in some places so thick that it is

actually easier to walk on the top of the bush than to cut a way through it. This dense and luxuriant vegetation, broken by many native clearings, is confined to the narrow strip of moist ground on the river edge. It contains scattered trees, of which the most valuable seems to be the Tana poplar (*Populus denhardtiorum*) which works and seasons well. On the backlands the trees and bushes, mostly drought-resisting species, are more thinly scattered. The soil is rich, and there is no doubt that artificial irrigation would raise it to a high pitch of fertility.

The Juba river forest is not less than 64,000 acres in extent. It averages half a mile wide, but in some places, on alluvial land, spreads out to 5-8 miles in width. Between Yonti and Mfudu it is separated from the river by alluvial flats between one and five miles wide, which are under native cultivation, and is itself one to five miles in breadth. North of Mfudu it follows the river bank for 100 miles, and varies in width from a narrow strip to about 8 miles. There is no satisfactory description of the timbers, which are said to be poor. The best seem to be two hard red woods, called daigan and shauri, which grow to a good size and are suitable for building. There is a little wild rubber. In the south-west nyika dense groves of acacia and dom, phoenix and raphia palms cover the alluvial strips bordering the Tsavo and Voi rivers. The Voi forest is estimated at 1,250 acres. From the point of view of health all these riverain forests—which are hot-beds of malaria—ought undoubtedly to be cleared, and the land, which is extremely fertile, brought into cultivation. Another large and dense forest, said to contain rubber vines and ebony, is reported to exist behind the thorn belt between Patas Island and Port Durnford. This must be regarded as an intrusion of the tropical coast-forest into the nyika zone ; but nothing definite is known of its character or extent.

The open country, especially the strip immediately behind the tropical coast belt, where the moisture is sufficient to allow grass to remain green most of the year, bears clumps of

trees ; chiefly dom palm, baobab, flat-topped acacia, and the two giant euphorbias (*Euphorbia candelabrum* and *E. nyikae*) which are often 40 to 60 ft. in height. On the hillsides and in the moister districts these may form extensive groves, with a rich undergrowth of aloes and other xerophytes. Flat-topped and stunted cedars (*Juniperus procera*) hardly recognizable for the same species as the giant tree of the highland forests, grow freely on the coastal hills near Kismayu, and small ebony trees (mpingu) are found through the southern nyika. A rare euphorbia, called wabaiyu, grows near Point Durnford, and furnishes poison for the arrows of the Boni.

North of the northern Guaso Nyiro and Lak Dera the nyika becomes more desert-like. Some of the lava and gravel wastes east and south-east of Lake Rudolf are absolutely sterile ; others are clothed with ephemeral pasture after the rains. North of Mount Marsabit there is a good deal of grassland. The wait-a-bit *Commiphora*, *Grewia* and mustard-tree (*Salvadora persica*) cover large areas with thorny bush—dense upon cotton soil, more open on sand—which closely resembles the flora of Somaliland. The baobab disappears, and the euphorbia becomes the principal tree. The richest vegetation is found in the hills ; on Marsabit, for instance, rich grass glades alternate with woodland, and dense forest encloses the crater-lake at an altitude of 4,300–4,700 ft. The river banks and the stream beds, where water can generally be found a few feet below the surface, are bordered by a heavy growth of dom palms, and often by groves of *Acacia tortilis* which grows to a large size. These two trees are the main constituents of the thick forest bordering the northern Guaso Nyiro ; dom palms predominating between Archer's Post and Marti, and acacia on the lower course. Where the river enters the Lorian swamp it is bordered by morasses of dense elephant grass. The Lorian itself is covered with reeds. The river bed running from its eastern end to the smaller Ururaha swamp is flanked by open grass-plains of black cotton-soil about three miles wide, beyond which the desert-like conditions are resumed.

SAVANNAH ZONE

The savannah or high-veldt zone, comprising all the open or lightly bushed country lying between the altitudes of 3,200 and 9,000 ft., occupies a restricted area in and around the Rift Valley, from Mount Elgon and Lake Victoria in the west to the Kenya district in the east. Included in it are the unforested parts of Naivasha and Kenya Provinces, most of Nyanza Province, and of Ukamba Province west of longitude $38^{\circ} 30'$ east. On its upper levels, for instance on the Mau plateau and the north side of Kenia, it extends into and above the highland forest zone as peninsular and insular areas reaching an altitude of 9,000–10,000 ft. On the lower levels it merges into the steppe.

The savannah zone is obviously that which is most capable of supporting a settled population. Hence, while large areas are and must always be only suited to pasture, in the more favourable parts—for instance the Kavirondo, Fort Hall, Lumbwa, and Uasin Gishu districts—the indigenous vegetation is giving place to native and European crops. Much—e.g. in the Laikipia, Meru, and Kavirondo districts and on the Rift Valley floor—consists of rolling pastoral country of a park-like type, broken by rocky hills. The distinctive character of the lower savannah region, however, is given to it by its immense open grass plains, such as the Athi, Yatta, Kapiti, and Loita. The quality of these plains varies greatly. The best are found where a stiff black ‘cotton soil’ replaces the ferruginous red earth of the nyika and forests. The lower and drier of these savannahs, particularly those south-west of the railway—Loita and Kapiti—differ only in degree from the true steppe. During the rains, they are covered with luxuriant grass, reaching about 3 or 4 ft. in height if undisturbed. The most conspicuous varieties are: *Setaria glauca*, *Andropogon finitimus*, *Themeda Forskalii*, *Sporobolus indicus*, and *Eragrostis Brownei*. This grass is quickly grazed down by the game and stock, and in the dry season withers. The country then becomes brown and waterless.

Many of these dry savannahs are typical acacia parks, dotted with thorn bush and drought-resisting trees, among which flat-topped and bushy acacias (*Acacia verugera* and *A. fistula*), giant euphorbias, and the sausage-tree (*Kigelia ethiopica*) are conspicuous. In the Rift Valley, and other places, these trees form extensive open forests of the 'dry' type. The riverain flora consists mainly of the yellow-barked and rough-barked acacias (*Acacia verugosa* and *A. stenocarpa*), the red-fruited fig (*Ficus stuhlmanni*), and the raphia palm. Elephant grass grows in the swampy ground, especially between Nakuru and Baringo. Much of this lower savannah, about the 4,000-5,000 ft. line, must once have been heavily wooded; and its present arid state is largely due to the destruction of its trees, which conserved the water received during the short and violent rains. Remnants of these forests, intermediate between the highland and tropical types, survive near Nairobi, and at Kakamega in Nyanza Province. Characteristic trees are the sandal or muhugu and croton or makinduri (*Croton elliotianus*) which is said to form 40 or 50 per cent. of the timber in some parts of Kakamega. This forest has some affinities with Mabira forest in Uganda, but contains no giant timber trees or lianas. It has a good stock of young saplings growing up. The gorgeous *Spathodea nilotica* grows freely on its outskirts. On the Kavirondo plains, the most fertile parts of which are closely cultivated, huge and ancient sycamore figs at rare intervals are now all that remain of the woods of the past, which have been steadily destroyed by the annual grass-fires and continual fresh clearings of native cultivators, who move on to a new tract when the first fertility of the land is exhausted. Re-afforestation with approved quick-growing species, at least on hill tops and ridges, is much to be desired.

The higher savannahs, and those receiving a more abundant rainfall—for instance, the best parts of the Nandi, Uasin Gishu, Mau, and Laikipia plateaux—are clothed with a dense growth of rich grass and herbaceous plants, and dotted with clusters of trees, flowering shrubs, and patches of bush. The

Kisii highlands, at an average altitude of 6,000–7,000 ft., consist of short grass downs with occasional groves of bracken. The flora of all this upper region is of the temperate type, closely related to that of the Abyssinian table-land. Pink and white clover and other temperate forage plants are indigenous. Among the best fodders are the so-called buffalo grass and the couch-grass or ikoka (*Cynodon dactylon*). Above the 7,000 ft. line the grass becomes perennial and penetrates into the forest zone as open glades. Brilliantly coloured flowers abound, including kniphofias, iris (*Aristia nandiensis*) and several varieties of coreopsis. The tree St John's wort (*Hypericum Schimperi*) is common. Among the many flowering shrubs are two beautiful forms of *Acanthus* (*A. arboreus* and *A. eminens*). The second, with large ultra-marine flowers, does not grow below 8,000 ft. Wild bananas and date palms are among the trees which flourish in the ravines and stream valleys, with the African clove (*Eugenia cordata*) and beautiful yellow flowered shrub *Cassia didymobotrya*. The depressions, and also the banks of lakes and rivers, are frequently swampy and filled with dense beds of papyrus (*Cyperus papyrus*) often 20 ft. high, which is the typical marsh plant of the highlands. Such large papyrus swamps border Lake Naivasha, and blue and pink water lilies (*Nymphaea*) cover the Rift Valley lagoons.

The trees of the upper savannah include stragglers from the steppe—mainly acacia and euphorbia—which are scattered over the open plains and in many parts form large open woods. Outliers of the lower highland forest are also found in this zone. Among these are the croton, specially common near Nairobi; the acacia-like mkuruwe (*Albizzia fastigiata*) a lofty tree with dark foliage, the grey olive or mutamayo (*Olea chrysophylla*) providing excellent fuel wood, the yellow-wood or outeniqua (*Podocarpus gracilior*) and cedar (*Juniperus procera*) which extends in a somewhat stunted and weather-beaten form into the Aberdare and Kenya plains. Measures are now taken to limit the destruction of these open wooded areas in the highlands, the fuel reserves attached to the

Much of the upper savannah consists of cleared bush and forest. It is here that the best arable is found ; for instance, in the Meru, Kikuyu, and Uasin Gishu districts. On its highest levels—e.g. Mau and Kenya—it runs up to the very edge of the highland forest and in some places extends beyond it to the moorland zone. There is as a rule no transitional belt of broken woodland, but the grassy belt is abruptly arrested by a solid wall of trees.

The forests of the Protectorate are almost wholly of the highland or extra-tropical type, ranging from 5,000 to 10,000-ft. above the sea. In 1911 the timber area reserved to Government was estimated at about two million acres, or 3,125 square miles, to which must be added the Lingham and Grogan leased forest in the Mau district, about 300 square miles, and about 155 square miles of private forest in process of destruction. Unfortunately before 1912, when this policy was abandoned, large areas of valuable forest—chiefly in the Mau—were alienated. A considerable amount of broken but valuable forest-land which should have been preserved in the Uasin Gishu and elsewhere was also granted to settlers for clearance.

Hosted by Google

stretched through the Nzoia drainage to the forest-belt of Elgon, and to west and south-west was continuous with the now isolated 'semi-tropical' forests of Kakamega and Kapwaren; thus linking up with the Uganda forest areas, and through them with the Congo equatorial forest. Even twenty-five years ago the eastern block, now divided into the two great mountain forests of Kenya and Aberdare, is known to have extended without a break from Nairobi to Kenya. In this period alone, the forest destroyed by native clearings in the Aberdare and Kikuyu districts amounts to about 224,000 acres, or nearly one-eighth of the whole forest area of the country. The process is accentuated by the wasteful methods of cultivation already referred to. No manuring is practised; but as the soil becomes exhausted it is abandoned and a fresh patch is cleared.

The principal highland forest areas are the Mau forest, with an area of about 1,200 square miles, comprising all the timbered land on the west slopes and escarpments of the Rift Valley, and including the Sotik and Kapwaren forests; Mount Kenya forest, about 625 square miles; Aberdare forest, about 500 square miles; Elgon forest, about 50 square miles; the Kilimanjaro, Laitok, Erok, and other highland forests on the former Anglo-German boundary, perhaps 75 square miles in all; the 'lower highland' forest near Nairobi and south of the Uganda railway, about 96 square miles. In addition to these patches of forest of a highland character crown isolated hills in the nyika and lower savannah zones. The Mdi forests, on the hills near Voi, are of this kind and are 6,000 acres in extent. Other examples are the cedar forest which fills the crater of Mount Suswa, the forests upon Marsabit and the Mathew range, and those crowning the little round hills between Kenya and the Aberdares, which separate the cultivated valleys of the Kikuyu.

With the exception of a few patches, such as those in the Mathew range and Taita hills, which are in a gneissic region, all the great forests are in volcanic districts. Their soil is which black leaf-mould, overlying a red clay heavily charged

with ferric oxide. Exposure and weathering converts this clay into a hard iron pan which cannot again support tree-life ; hence careless deforestation of the East African highlands may do irreparable damage. The measures taken by the Government under the Forests Ordinance have already checked destruction and repaired some of the damage of the past. The clearance of squatters, control of fires, replacement of leases by the present system of licence, and strict regulation of all felling of trees and cutting of poles are giving good results (see below). At 'New' forest, Lari, and other forest stations in native reserves, a system of registered forest cultivators is being tried. These are natives permitted to cultivate forest land under the supervision of foresters, on condition that they plant young trees with their crops, and surrender their holdings after a few years. In districts ruined by indiscriminate native clearings, this is often found a cheap form of renovation and protection. 'The forest cultivator is a good friend but a bad enemy.' Regeneration is fortunately rapid, where fires are checked and goats and unlicensed cultivators have been got rid of. Coppice springs up quickly in the clearings ; especially bastard cedar or mkahakuha, a useful soft wood which propagates rapidly from suckers. The poles are much used for native huts. There are two varieties, red and white. Mtundu (*Macaranga sp.*), muhu (*Markhamia hildebrandtii*), and mukao (*Dombeya nairobiensis*) also increase at a great rate.

Since widely different conditions are found on the lower and higher levels and on the dry western and moist eastern slopes, the forests contain many sorts of trees. Croton is the characteristic species on the lower levels, from 5,000 to 6,500 ft., and is specially common in the forest near Nairobi. On the forest margins and in the riverain belts which extend into the savannah, muhugu or sandalwood, by far the most valuable tree of the lower highland zone, is found. It is unfortunate that the best sandalwood forests near Nairobi were alienated and destroyed before their value was realized. Albizia, muchorowe (*Nuxia congesta*), Indian pine (*Maba*

abyssinica), greenheart (*Warburgia ugandensis*) pillar-wood (*Weihea africana*), pinkwood (*Euphorbeacea*), mukao and smokyheart (*Canthium schimperianum*) all grow on these levels; but most of them improve in quality in the higher zone. On the lower moist slopes they are mixed with an undergrowth of tree ferns (*Lonchitis pubescens*), dracaenas, wild banana (*Musa livingstonia*), the columnar *Cusonia spicata*, and the rubber-giving muwele (*Tabernaë montana abyssinica*). On the lower dry slopes the scrub consists mostly of grey olive and camphor bush.

It is in the upper forest, from 6,500 to 8,000 ft., that the giant timber trees are found. Here the trees are densely massed, the enormously developed foliage and branches producing a perpetual gloom; and it is only where thus protected by association from the direct power of the sun that they seem capable of attaining their full size. In the wet forests, that is to say those with an eastern and south-eastern aspect, the most widely spread species are the coniferous yellow-wood or musangera (*Podocarpus milanjana*) sometimes called the African yew, and the finer but less common outeniqua (*P. gracilior*). Both give a useful timber. *P. gracilior* is closely related to the big South African yellow-wood *P. elongata*, but has a less massive growth. The giant camphor or muzaiti (*Ocotea usambarensis*), ranging from 6,000 to 7,500 ft. in altitude, is the most majestic tree of the highland forests. It has a spreading growth like that of an English park oak. Good specimens have unbranched boles 80 ft. high and trunks 12 ft. in diameter. The timber is a good teak substitute. Associated with it are two valuable hardwoods; greenheart or muziga, and stinkwood or mueri (*Pygeum africanum*) which gives a heavy and durable red timber. The pillar-wood, remarkable for its tall clean boles, Indian pine, black ironwood or musharage (*Olea hochstetteri*) giving a heavy and durable timber of beautiful grain, white ironwood or munderendu (*Todallia sp.*), albizia, and grey box or munyenye, are all denizens of the wet forests to 8,000 ft. A common tree is the killer fig

(*Ficus mallocharpa*). This, when young, twines itself round a small tree which it gradually kills, itself growing to an enormous size. The bastard cedar is plentiful. Other species found in the mid-forest are mushami (*Allophyllum abyssinicum*), safraan or mutanga (*Elaeodendron* sp.), and mutati (*Heptapleurum* sp.). Great lianas, including a rubber-producing landolphia, form a network in many parts of Mau and Kenya. The commonest undergrowth is the prickly *Acanthus arboreus*; but in the best camphor forest there is little or none. The comparatively poor condition of a great part of Kenya is largely due to the over-development of bush, which checks the growth of young trees.

The 'dry' forests of the western slopes are principally composed of cedar or mtarakwa (*Juniperus procera*), which often grows to a great size, clean boles 60 to 80 ft. high being not uncommon. These large trunks, however, are nearly always hollow and useless, being subject to a fungoid disease which eats out the heart of the tree. The cedar forests as a whole have not fulfilled expectations; the wood, though beautifully marked, is brittle and splits badly when worked; large planks in good condition are seldom obtained. Associated with the cedar are the grey olive and black ironwood (*Olea chrysophylla* and *O. hochstetteri*) both giving a heavy and durable timber. Black ironwood is a furniture wood of great beauty. The Cape chestnut or mlalachi (*Calodendron capense*), greenheart, stinkwood, yellow-wood, and white ironwood all grow in the dry forest between 7,000 and 7,500 ft. The commonest undergrowths are a species of *Plectranthus* and a bramble (*Rubus*) which forms thickets on the lower slopes; but some of the best cedar forest is carpetted with grass.

The timber-trees range upwards to about 8,500 or 9,000 ft. Above 8,000 ft. they become fewer in number and, on the wetter ground, mixed with clumps of bamboo; but there is little or no sign of the dwarfing characteristic of mountain forests in the temperate zone. On the upper timber-line the large tree *Hagenia anthelmintica* is characteristic. Between 9,000 and 10,000 ft. on the wet slopes of Kenya, the Aberdares, and

the Mau escarpment, trees vanish ; their place being taken by a dense forest of mountain bamboo (*Arundinaria alpina*) which grows on these levels to the exclusion of all other trees, and forms an almost impenetrable jungle. The stems stand only a foot or two apart and reach 30, 40 or even 60 ft. in height, branching repeatedly from 10 or 15 ft. upwards.

The only stragglers into the bamboo belt are the yellow-wood and black ironwood. There is no undergrowth, and therefore little animal life, though the creatures of the timber forest, such as the bongo and elephant, often take refuge in the bamboo belt.

The principal highland forests are as follows :

Aberdare Forest.—This has a total area of over 500 square miles. It extends north and south upon the slopes of the Aberdare mountains above 6,600 ft. from Ol Bolasat to Lari, a distance of 82 miles. The southern portion of the eastern slope, about 50 miles long and 3 broad or 150 square miles in extent, is wet forest ; the northern portion, varying from 20 to 32 miles in length and about 13 broad, with an approximate area of 357 square miles, is drier. The south-eastern forest, once probably 10 miles broad, has been reduced to its present size by the encroachments of the Kikuyu, here responsible for the destruction of about 350 square miles of woodland. It has a heavy rainfall, and consists chiefly of camphor, yellow-wood, pillar-wood, and killer fig. The camphor is less abundant than on Kenya, and dies out going south. There is an upland zone of bamboo estimated at 65 miles long and 3 miles broad. The south-western slope, once covered with cedar and olive, has been much impaired by fire, but is in process of regeneration since the prohibition of grass burning. Experiments in clearing the undergrowth round the young cedars at Kinangop have been successful. The northern forest consists mainly of smallish cedar, which grows luxuriantly in the drier valleys, sometimes reaching 40 or 50 ft. high but oftener forming low branched, round-topped trees, which extend as open woods into the savannah. Aberdare forest was cleared of squatters by the end of 1911,

and is controlled from forest stations at Lari, Kinangop, Eastern and Central Aberdare, and Northern Sattima.

Kenya Forest.—This is probably the most valuable timber forest of the Protectorate. It forms a crescent-shaped girdle round the mountain 120 miles long on the lower edge, and only broken on the north-west by a gap 6 miles wide. At its greatest breadth, between Kenya summit and Nyeri, the forest is 16 miles broad, the average being 8 to 10 miles; and its area is about 625 square miles, of which about one-third is bamboo. The estimated average of mature timber per acre is 3,265 cubic ft. On the south-eastern side, the trees begin at about 5,900 ft., and on the western side at about 7,000 to 7,500 ft. The lower edges, especially on the west, have greatly suffered from the clearings and grass fires of the Kikuyu. The distinction between wet and dry forest is sharply marked on Kenya, though the rainfall on the south-eastern slope is only moderately accentuated, and does not approach that of the Mau highlands. The wettest area and most heavily timbered forest is in the Embu country, in the great south-eastern bay of the mountain, enclosed by ridges running out from the central massif. This is the zone of giant camphor trees and hardwoods. Here the trees are so close and dense that perpetual gloom reigns and even at noon the heat of the sun is hardly felt. The camphors, many of huge size, lie along a belt between 6,000 and 7,500 ft. in the best parts of which—at about 7,000 ft.—there is little or no undergrowth. The hardwoods range from 5,500 to 8,000 ft., but the best lie between 6,000 and 7,000 ft. These are mainly munyenye or grey box, stinkwood, which covers large areas but does not grow to a great size, and greenheart. Pillar-wood and yellow-wood are found everywhere. Other abundant trees of the wet forest are the bastard cedar, smokyheart, wingwood or mutuma (*Schrebera alata*), and Cape plane or mungarima (*Ochna sp.*). This is a slender tree of great height, which gives a useful tough timber. In the lower wet forest where the greatest variety of trees is seen the albizia and Ibean poon or muna (*Chrysophyllum sp.*)

give well-grown timber of great size, but are not plentiful. The timber in the upper forest suffers from excessive wet ; the number of species declines, and the trees are often diseased and covered with lichen and moss, which in this zone attains an abnormal development. Bamboos begin at about 7,400 ft. and at 8,000 ft. form a dense forest 22 miles long, with only about two timber trees to the acre. Timber line is at about 8,500 ft., and above this the bamboo extends unbroken to 9,000 ft. or more. It attains a great size in the rainiest part of the mountain, where stems 5 in. in diameter and 60 ft. high are found.

The western and north-western forest, only receiving about two-thirds of the rainfall of the eastern slopes, consists largely of cedar, plentiful in all but the wettest parts. The lower fringe of the north-western bay contains a high proportion of yellow-wood, especially the valuable outeniqua, which here forms a long broken belt mixed with cedar, from 500 yds. to 2 miles wide. Dense galleries of cedar and yellow-wood clothe the ravines which extend from this bay into the savannah. A sample area measured on the Nuki river gave 5,041 cubic ft. of timber to the acre, 46 per cent. being outeniqua and 28 per cent. cedar. In the north, near the 'forest gap' the cedars form well-marked upper and lower belts ; hardwoods—chiefly stinkwood, olive, box, and Boer beech—occupying the wetter middle zone. The cedar sample-area, with 4,750 cubic ft. of timber to the acre, gave 91 per cent. of this tree, which ranges from 7,000 to 11,000 ft. In the northern part of the upper belt the cedar is mixed with cork or mzuchai, and jarrah or moinyere. This is the last big tree found at high altitudes, range to 12,000 ft. Farther south, a wedge-shaped belt of yellow-wood, with bamboo in all the swampy patches runs along the entire western slope, thinning out to the north, where it gives place to hardwoods. There is on this side no continuous bamboo forest. Grey olive is abundant on the drier ground, black ironwood and greenheart fairly plentiful in the north-west. The drier cedar forests are carpeted with a thin pasture grass, or sometimes with *Plectranthus* ; the yellow-wood zone,

which is damper, with the coarse African tree-moss. Here and there are grassy glades, with elder and blackberry bushes.

Kenya forest is demarcated, and controlled by two forest stations: West Kenya and South Kenya. Bridle paths have been cut through it, giving access to the moorland zone. It is also traversed by many native tracks, chiefly used by the bee-keepers, who ascend to the upper timber line with their hives. So far, the forest has been little exploited and it is the intention of the Government (1918) to leave it untouched for the present. Only a few small tracts on the lower ground have been leased. The collection of wild rubber has not repaid expectations. Owing to the gradual slope of the mountain, the removal of timber will be much less costly and difficult than in the Aberdares; but its profitable exploitation must depend on improved communications with the railway and coast.

COMPARATIVE TABLE

Sample Areas of Kenya Forest

I. South-east Upper Mixed Forest. Altitude, 6,850 to 8,750 ft. Area 21.49 acres. Stock per acre, 2,098.37 cubic

<i>Principal trees.</i>	<i>No. of trees.</i>	<i>Percentage.</i>	<i>Cubic ft., gross cylinder.</i>	<i>Percentage of cubic ft.</i>
Camphor	72	27.72	64,029.11	71.00
Yellow-wood	110	41.66	13,052.72	14.47
Wingwood	44	16.66	6,643.31	7.37
Pillar-wood	6	2.27	593.57	0.66
Mukongoro	6	2.27	509.64	0.57
Mutundu	4	1.51	326.24	0.36
Box	4	1.51	708.10	0.79
Ibean ash	2	0.76	265.11	0.29
Tumara	3	1.14	372.74	0.41
Chogi	3	1.14	551.21	0.61
Tabernamontana sp. . . .	3	1.14	209.81	0.23
Muzegeta	2	0.76	2,439.64	2.70
Wild Lemon	1	0.38	26.18	0.03
Cape plane	1	0.38	158.75	0.18
Bastard cedar	1	0.38	125.36	0.14
Mutendera	1	0.38	80.79	0.09
Mutaozu	1	0.38	95.45	0.10
Total	264	99.99	90,187.73	100.00

II. South-east Camphor Forest. Altitude, 6,850 ft. Area, 3.60 acres.
Stock per acre, 7,945.09 cubic ft. Linear area taken through centre
of best forest.

<i>Principal trees.</i>	<i>No. of trees.</i>	<i>Percentage.</i>	<i>Cubic ft., gross cylinder.</i>	<i>Percentage of cubic ft.</i>
Camphor	31	40.26	50,348.68	88.02
Yellow-wood	20	25.97	2,799.68	4.89
Indian pine	14	18.18	2,052.81	3.59
Black ironwood	3	3.90	421.73	0.73
Wingwood	4	5.19	845.93	1.48
Pillar-wood	2	2.60	279.02	0.48
Bastard cedar	1	1.30	188.15	0.32
Mukao	1	1.30	121.18	0.21
Mukongoro	1	1.30	147.48	0.28
Total	77	100.00	57,204.66	100.00

III. Upper Cedar Forest, Nuki River. Altitude, 7,700 to 7,900 ft.
Area, 2.03 acres. Stock per acre, 3,120.54 cubic ft.

<i>Principal trees.</i>	<i>No. of trees.</i>	<i>Percentage.</i>	<i>Cubic ft., gross cylinder.</i>	<i>Percentage of cubic ft.</i>
Cedar	40	58.82	10,195.79	80.47
Ironwood	14	20.59	1,292.93	10.21
Outeniqua	6	8.83	897.25	7.09
Grey Olive	7	10.29	191.94	1.51
Mwazazia	1	1.47	91.40	0.72
Total	68	100.00	12,669.31	100.00

The following trees below 18 in. diameter are not included: yellow-wood 42, outeniqua 18, ironwood 4, cedar 2.

IV. Lower Cedar and Olive Forest, North-west Bay. Altitude, 7,400 ft.
Area, 3.20 acres. Stock per acre, 2,644 cubic ft. Characteristic second
class dry forest.

<i>Principal trees.</i>	<i>No. of trees.</i>	<i>Percentage.</i>	<i>Cubic ft., gross cylinder.</i>	<i>Percentage of cubic ft.</i>
Cedar	94	76.49	7,592.01	89.70
Grey Olive	13	10.56	275.29	3.25
Greenheart	11	8.95	426.25	5.03
Ironwood	5	4.00	169.95	2.02
Total	123	100.00	8,463.50	100.00

The following trees below 18 in. diameter are not included: olive 84, ironwood 76, cedar 25, greenheart 12.

Mau Forest.—Under this name is included all the highland forest on the western escarpment and slopes of the Rift Valley.

This is by far the largest forest area in the Protectorate, the total extent under timber being estimated at about 1,200 square miles. It does not consist, like Kenya, of one compact belt of trees, but is irregular in shape and broken up by stretches of grassland and scrub. Before 1912, when this policy was abandoned, some of the most valuable part of Mau forest was granted in concessions, the most important being those made to Dr. Atkinson and Messrs. Lingham and Grogan. These, now wholly under the control of Messrs. Lingham and Grogan, are at least 300 square miles in extent, and contain some of the finest timber in the colony. Of the rest a considerable part is still unsurveyed, and estimates of its size and quality are therefore only approximate. The forest is made up as follows :

Elgeyo forest, the bulk of Lingham and Grogan's, stretching to Nandi. About 93 square miles of good forest.

Sotik to Naivasha, the largest of the Mau forests, about 25 by 15 miles, or at least 375 square miles.

Elgeyo escarpment forest, on the northern side of the Uasin Gishu, about 140 square miles.

The Londiani-Mau forest, from Mount Blackett, 32 square miles.

The Ravine-Khamasia, the poorest part of the Lingham and Grogan forest, 129 square miles.

Scattered Nandi forests, including Tindoret and Kapwaren, 250 square miles.

The Sotik and Lumbwa forests, between the highest point of Mau and Lumbwa, excluding bamboo, 50 square miles.

Mount Londiani forest, on right-hand side of road to Ravine, including the Lingham and Grogan forest, 134 square miles

Mau forest receives an excessive rainfall, both from east and west, as it is the meeting ground of rains from the Indian Ocean and the Congo region. On all the higher parts, it is wet for nine months of the year; hence there is no sharp division of 'wet' and 'dry' slopes. Bamboo jungle, growing to a great size, fills all the wettest areas. A zone of wet, cold

forest, consisting of yellow-wood, cedar, black ironwood, and olive, goes completely round the massif immediately below the main bamboo belt. In these wet areas, which are heavily timbered, the cedars grow to a great size, but are often unsound; in other parts, however, and especially in the Sotik, the cedar forms a pure forest of straight mast-like stems. The finest timber is found on a strip running parallel to the Elgeyo escarpment, which is probably the most heavily stocked forest area of the Protectorate. It consists mainly of yellow-wood, especially the valuable outeniqua, with some large cedars. A part of this coniferous forest, lying in the Lingham and Grogan concession, has been estimated to contain the enormous amount of 15,000 cubic ft. of timber to the acre. There is a good stock of young trees. Where it borders the Uasin Gishu plateau, the Elgeyo forest is mixed with grasslands, which are burnt off annually. The stocking of the best ridges of the Eldama Ravine west forest, mainly yellow-woods, cedar and ironwood, is calculated to be about 6,000 cubic ft. to the acre; and the general average, exclusive of the wytych-hazel areas, about 2,000 cubic ft. The lower forest is inferior to the upper, containing many grassy glades and large coppices of the straggling wytych-hazel or ol bulegug (*Trichocladus malosanus*).

Greenheart is the principal hardwood of Mau, and is widespread, especially in the drier parts. Sandal and killer-fig grow on the lower levels. There is a dense undergrowth, including in Nandi forest a large expanse of wild coffee, which grows abundantly over an area estimated at 160,000 acres and is gathered for sale. Mosses, lichens and lianas attain in many parts an amazing development, and the exploitation of moss, which is used in South Africa for fruit packing, has been suggested. The rubber vine (*Landolphia*) is not uncommon. Nandi is probably the most promising region of the highlands for the collection of wild rubber.

Mau forest owes its great richness not only to the high rainfall, but also to the immense thickness of its fertile red clay, formed of ancient volcanic rocks and gneissès. It is

almost free from natives, and has therefore escaped the destruction wrought by cultivators on the lower slopes of Kenya and Aberdare, though a certain amount of damage has been caused to the margins by grass fires. *Per contra* it is now necessary to import labour to work the forest, which is being exploited on a considerable scale, especially in the Lingham and Grogan concession.

Elgon Forest.—The forest belt on the south and east flank of Elgon seems to be much smaller than was at first supposed. There is so far little detailed information as to its character. The area is probably about 50 square miles. On the foothills, up to 6,000 ft., the forest is of a tropical type, the principal species being *albizia*.

Kilimanjaro Forest.—The best parts of the Kilimanjaro forest lie outside the present boundaries of the Protectorate. On the north-east slope, however, the Laitok forest, estimated at 12 square miles, and lying in British territory is reported to contain well-grown timber of the dry type, principally cedar; the best being near Endwoinet. The lower forest margin is at about 6,000–6,500 ft., and it improves in quality as the mountain is ascended, but generally speaking is inferior to Mau and Kenya. The undergrowth is dense, and tree ferns border the streams. About 7,500 ft., wet forest begins and extends to the edge of the moorland zone, at about 8,500 ft.

Other highland forests on the southern boundary include Erok, a compact block about 16 square miles in area, on the rocky hills of Ol Donyo Erok about 70 miles from Kilimanjaro summit. This is understood to be highland forest of fair quality, becoming open woodland on the lower levels, where a camp was established during the military operations of 1915.

The remaining forests on the southern border are as yet imperfectly known, but believed to cover about 50 square miles in all. A considerable tract, sometimes known as 'Smith's Forest' is reported north-west of Lake Natron, on the slopes of the Ndasegara escarpment, and is said to consist chiefly of cedar and other trees of the dry-forest type.

MOORLAND ZONE

The lofty region between the bamboo belt and the snowline (approximately 10,000 to 14,500 ft.) forms an open moorland, usually boggy, perpetually wrapped in mist and dripping with moisture. It is the home of a special flora, peculiar to the alps of equatorial Africa, and found again at the same elevations on Ruwenzori. In the Protectorate, this region is confined to the upper levels of Kenya, the Aberdares, Kilimanjaro, and Elgon. Two distinct plant-associations characterize the moorland zone: namely, the heaths and the lobelias. Between 10,000 and 12,000 ft. the typical plant is the tree-heath (*Erica arborea*), which, in sheltered places, often grows tall and forms open woods, but appears as a low bush on exposed slopes. The stems make excellent firewood, and are invaluable to travellers in this region. The branches of the heaths are clothed with long grey lichen; the ground is carpeted with thick mats of moss and alchemilla (*A. argyrophylla*). On the lower edge of the heath-belt a tree St. John's wort (*Hypericum lanceolatum*) with large golden flowers, grows in profusion. Several species of mountain everlasting (*Heliochrysum*) are distributed through the moorland zone. Between 12,000 ft. and the snow line, the alchemilla disappears. The ground is covered by heavy tussocks of a grasslike rush, *Ucinia*. Amongst this grow the wierd tree-grounsels (*Senecio keniensis*) and giant lobelias (*Lobelia gregoriana* and *L. teleki*) often 15 to 20 ft. high, which give the upper levels of Kenya and Elgon their peculiar character. Save in sheltered corners there is little vegetation above 13,500 ft. but the *Ucinia*, which alone seems able to resist the intense cold. A few patches of lichen have been found at 16,000 ft. on Kenya.

The moorland zone on Kenya, where it is most developed, has an area of 352 square miles. In the north, it is a rolling grass plateau, but in the south consists mostly of bog. Here a belt of giant heaths and tussock grass succeeds the bamboo forest; and above this marshes, with lobelias, senecios

and rush, stretch to the foot of the glaciers. The whole region is dripping in the wet season, and during the cold months is wrapped in cloud and mist. On Aberdare, the moorland is an open zone of downs. On Elgon, where snow never lies, it comprises the crater walls and floor. On Kilimanjaro the tree-heath zone is said to begin at 8,500 and extend to about 10,500 ft., which is timber line. Many of the trees grow to 20 ft. in height, with stems 18 in. in girth. The upper levels to 13,000 ft. are reported to be open downs.

SYNOPSIS OF CURRENT RULES UNDER THE FORESTS ORDINANCE OF 1911

Proclaimed Forests.—The chief forest areas are now proclaimed and demarcated. Such demarcated forest may not be alienated without the express consent of the Governor in Council and two forestry officers. Within proclaimed forest no felling of trees, gathering of products, removal of wood, squatting, firing, clearing or grazing may take place, except under licence. Travellers on the public roads may, however, take necessary dry wood for fuel; and resident natives have certain rights to firewood, &c. The principal proclaimed forest reserves are Kenya, Aberdare (between the two Chania rivers), Kapsaret (Uasin Gishu), the forests of the Kikuyu escarpment, Molo, Nyeri hill, Lake Nakuru, Naivasha, Londiani, the Nairobi municipal forest, and Arabuko-Sekoki.

Crown Lands.—On Crown lands other than reserved forest, and including unleased mangrove swamps, unprotected trees may be felled, poles cut, and firewood or products gathered, upon payment of royalties. Protected trees may not be felled, cut, or injured, except under special licence. Fuel areas are demarcated and reserved near the principal townships.

Licences.—A licence to fell in reserved forest is usually granted for 5 years, renewable for 2 years. The fee is Rs. 75 on application, and Rs. 750 on execution of the licence. The usual royalty must be paid on all timber cut. The fee for the execution of the licence is deducted from the first year's royalties. The price of a licence to gather wild rubber is Rs. 100. Every licence, whether for felling, grazing, clearing, &c., specifies the area within which operations may take place, what trees may be felled, &c. Licensees must fell all trees marked by the forestry officer in their holding.

A license to remove one head-load of dead firewood daily for a month without the use of an axe costs 50 cents; with the use of an axe, Rs. 1, or 3 cents for every stacked cubic foot.

Royalties.—Within a 10-mile radius of Nairobi, or 5 miles of the Uganda railway and its branches, or 5 miles of any recognized coastal port: Cedar, ebony, sandal (muhugu) and camphor (muzaiti) pay 30 cents per cubic foot.

Red stinkwood (mueri), copal (mtandarusi), yellow-wood (musangera), and East African teak (mbembakofe) 25 cents per cubic foot. Other reserved trees, 20 cents; unreserved trees, 6 cents. Poles up to 10 ft. long, 25 cents each; 10 to 15 ft., 45 cents; 15 to 28 ft., 80 cents. Poles of mutundu (*Macaranga* sp.) and mukao (*Dombeya nairobiensis*) 5 cents.

Wild rubber, 25 cents per lb.

All these royalties are subject to a reduction of 1 per cent for each mile outside the specified areas, the minimum being 50 per cent. of the above rates.

On produce taken from unleased mangrove swamps the following royalties must be paid:

Borities, up to 18 ft. long, Rs. 1.25 per *korja* (score) and above 18 ft., Rs. 1.50.

Mkombo mayo, pau and mzio, 75 cents per *korja*.

Nguzo, 50 cents each.

Fuel, 1 and 2 cents per stacked cubic foot.

Gum copal, 1 cent per lb.

RESERVED TREES

The following trees and their products are protected where growing on Crown Lands:

<i>Genus and Species.</i>	<i>English name.</i>	<i>Native name.</i>
<i>Afzelia cuanzensis</i>	East African teak	Mbembakofe
<i>Allophyllum abyssinicum</i>	Horse chestnut	Mshame
<i>Albizzia fastigiata</i>	Albizia	Mkuruwe
<i>Brachylaena hutchinsti</i>	Sandalwood	Muhugu
<i>Brachylaena</i> sp.		Muhuhu
<i>Bruguiera gymnorhiza</i>	Mangrove	Mchumsi
<i>Calodendron capense</i>	Cape chestnut	Mlalachi or Muroroa
<i>Canthium schimperianum</i>	Smokyheart	Ruazi
<i>Catha edulis</i>		Mairungi
<i>Celastrus</i> sp.		Muthisioi
<i>Ceriops candolliana</i>	Mangrove	Mkanda
<i>Chlorophora excelsa</i>		Mvuli
<i>Combretum schumannii</i>		Mpera mwitu
<i>Dalbergia melanoxydon</i>	Ebony	Mpingu
<i>Drypetes</i> sp.		Munyenye
<i>Elaeodendron</i> sp.	Safraan	Mutanga
<i>Euphorbeacea</i>	Pinkwood	Mukarara
<i>Gelonium procerum</i>	Grey box	Munyenye
<i>Heptapleurum</i> sp.		Mutati
<i>Heritiera littoralis</i>		Mgongonge
<i>Juniperus proceri</i>	Cedar	Mtarakwa

<i>Genus and Species.</i>	<i>English name.</i>	<i>Native name.</i>
<i>Landolphia Kirkii</i>	Rubber vine	Mpira
<i>Maba abyssinica</i>	Indian pine	Mairothi
<i>Markhamia hildebrandtii</i>		Muho
<i>Mascarenhasia elastica</i>	Mgoa rubber	Mgoa
<i>Mayepea welwitschii</i>		Mutukuyu
<i>Mimusops</i> sp.		Mugambwa or Muno
<i>Ocotea usambarensis</i>	Camphor-tree	Muzaiti
<i>Olea chrysophylla</i>	Olive	Mutamayu
<i>Olea hochstetteri</i>	Black ironwood	Musharage
<i>Piptadenia b Buchananii</i>	Ibean teak	Mkoi
<i>Podocarpus milanjiana</i>	Yellow-wood	Musangera
<i>Podocarpus gracilior</i>	Outeniqua	Musangera
<i>Pygeum africanum</i>	Red stinkwood	Mueri
<i>Rapanea rhododendroides</i>	Boer beech	Mugaita
<i>Rawsonia usambarensis</i>		Mutendera
<i>Rhizophora mucronata</i>	Bark mangrove	Mkoko
<i>Tamarindus indicus</i>	Tamarind	Mkwadju
<i>Terminalia</i> sp.		Mpera murtu
<i>Todallia</i> sp.	White ironwood	Munderendu
<i>Trachylobium hornimannianum</i>	Copal	Mtandarusi
<i>Vitex Keniensis</i>		Muhuru
<i>Warburgia</i> sp.		Mkarambiki
<i>Warburgia ugandensis</i>	Greenheart	Muz ga
<i>Weihea africana</i>	Pillar-wood	Musaizi
<i>Zanthoxylum</i> sp.		Shughoma

CHAPTER V

FAUNA

General—Mammals—Birds—Reptiles and Fish—Insect and other
Pests—Appendix : List of Big-Game Animals.

GENERAL

THE East African Protectorate is very rich in animal life, especially big game ; and is probably the best and most popular hunting ground in Africa. The number of resident species is large, and includes animals of the forest, bush, plains, and desert. Most of the larger mammals are represented by distinct East African races, and many by both highland and lowland forms.

The settlement of the highlands has much reduced the area over which game can roam unmolested, and changed the distribution of many species ; but immense districts remain in which the wild life is practically undisturbed. On the open plains of Athi, Loita, Tana river, the northern Guaso Nyiro, and Jubaland, and in the Reserves, great herds of antelope and zebra still wander in a semi-tame state ; though this sight is gradually becoming less common in the region north of the railway. Less destruction has been wrought among forest and bush animals, such as buffalo, bongo, and forest-hog, than among the plain dwellers, their habitats being more difficult of access ; and these now give the most interesting sport.

Immediately before the war, which of course greatly reduced big-game hunting, the northern Guaso Nyiro was the favourite sporting district, being well stocked with lion, buffalo, rhinoceros, eland, oryx, and numerous other antelope and gazelle. This region, with Laikipia plateau and Tana river, has now been practically undisturbed for several years, almost certainly to the benefit of the game supply. The Loita plains have

always been favourite hunting grounds, the shooting along this part of the German boundary being good and varied. This is now perhaps the best lion district. There is still much game on the Thika river and Athi plains, though much of the best land is now being brought into cultivation. The Athi district, which is largely private property but still consists mainly of unbroken grassland, is now chiefly shot for lion, which were plentiful until recent times but have lately been much reduced. Antelope run small owing to excessive destruction of the big bucks; with the exception of eland, they are remarkably free from the ticks which infest most species of game such as lion, zebra and rhinoceros. The Rift Valley and Uasin Gishu are now largely settled, and the rich animal-life described by travellers only a few years ago has mostly vanished, except from the forests and private preserves. This steady retreat before advancing colonization may lead to the overcrowding of the remaining game country and will certainly increase the privations and destruction of game in droughts, when thousands, weakened by want, are killed by parasites and disease. In trekking the country a knowledge of game distribution is valuable, game meat being an important resource and, in some parts, a necessity of life. Porters do better on a partial meat diet than on grain alone, and expect it to be provided. Zebra and hartebeest are the best kills for them; small buck for European tastes.

A good variety of game birds is met in most districts: guinea-fowl and francolins are the best eating. Waders and water-fowl abound on the Rift lakes. Edible fish are abundant in Lake Victoria and in many of the other lakes, and the rivers. Fish is also plentiful off the coast, especially between November and March, and is obtainable in Mombasa market throughout the year.

Economically, the most important animal in the country is, or was, the elephant, but it is now only found in a few remote regions. The ostrich, which is still numerous in the wild state, is believed to have a future; though, chiefly owing to the recent slump in feathers, ostrich-farming has not yet proved a com-

mercial success. Experiments in the domestication of the eland, which is easily tamed and might perhaps be used for draught as well as meat, have been carried on during the last few years, but so far have proved disappointing. Special provisions of the game ordinance allow land-holders to capture but not kill eland found on their estates, and registered ostrich-farmers to collect eggs and wild birds for domestication.

The question of the preservation of game is still a controversial one. There can be little doubt that some species constitute at least a pest, and at worst an active danger, if allowed to multiply in settled districts, and there is a strong demand on the part of farmers for their reduction. Many kinds—especially buffalo, giraffe, and many species of antelope, such as eland—are subject to rinderpest and other diseases, and are suspected of conveying the infection to stock. Others are highly destructive. Chief among these is the zebra, which stampedes through the strongest fencing, tramples crops, and fouls the grazing-grounds with a worm very injurious to equines. Certain small buck feed voraciously on any young crops to which they have access. Bush pigs in an agricultural area are terribly destructive, and are also, like wart-hog, suspected of carrying swine fever—a matter of great importance to the pig-breeding industry. These and leopards are rightly classed as vermin, and there is nothing to be said in favour of their preservation in settled districts. Lions and cheetahs, to which a limited protection has lately been extended, are also out of place on pastoral land and near centres of population. With regard to the other characteristic fauna, however, most British settlers recognize them as an asset to the country, and are willing to co-operate in their preservation; and cases of useless and unnecessary slaughter are comparatively rare.

Elaborate game ordinances protect and limit the destruction of all the more interesting animals. Under these ordinances elephant, giraffe, ostriches, marabouts, and all owls, egrets, vultures, and fish-eagles enjoy absolute protection. Eland, roan, greater kudu, Neumann's hartebeest, and hippopotamus

are protected in certain areas (see Appendix) and female sable, roan, greater kudu, and buffalo everywhere. Young antelope, gazelle, rhinoceros, and hippopotamus may not be hunted, nor may the females of these species when accompanying their young. Other species of game (including birds) may only be hunted, killed, or captured under licence.

Several kinds of licence are in force. A Sportsman's Licence (price Rs. 750) or a Resident's Licence (Rs. 150), for which genuine residents or naval, military, or administrative officers on service are alone eligible, carries the right to kill or capture on public land a limited but generous number of the chief game animals (see Appendix). As a matter of fact, the numbers permitted are seldom obtained. Game lawfully killed or captured on private land does not count. An additional licence, price Rs. 150, is needed for the killing or capture of one elephant or one bull giraffe ; for two elephants, Rs. 450. A Resident's Licence may also be granted once in the year for a period of 14 days, price Rs. 30. A Traveller's Licence, price Rs. 15, valid for one month, gives the right to kill on private land, with consent of owner or occupier, any animal available under a sportsman's licence, and on public land five in all from among the following species : Grant's gazelle, impalla, oryx beisa, wildebeest, bushbuck, gerenuk, topi, Jackson's hartebeest (one of each), klipspringer, steinbuck, reedbuck, Thomson's gazelle, Coke's hartebeest, dik-dik, suni. The topi may only be shot in Jubaland, Tanaland, or the Loita plains. A Landholder's Licence, price Rs. 45, may be held by any occupier of land or person in his permanent employ, and permits the killing or capture on any private land, with occupier's sanction, of the animals available under a Sportsman's Licence. Eland may be captured, but not killed, under this licence. Landowners in good game districts are therefore able to let their shooting as a whole, or shooting-rights in some special animal, to visitors, who can thus get a good variety of trophies without the expense of a Sportsman's Licence. This custom, which is highly profitable, encourages settlers to protect the game on their estates, and is greatly in the interest of game preserva-

tion. Landowners may destroy animals damaging their crops, and natives may be authorized locally to kill certain species for food. Hunting with dogs is forbidden on public land. A general licence to shoot wild-fowl, excluding the protected species, costs Rs. 5 annually. For ostrich-hunting a special licence, price Rs. 45, is required. There is a tax of Rs. 1,500 on the export of living birds, and of Rs. 75 on each unblown egg, which may be remitted if they are required for scientific purposes. Fishing for profit is also controlled by licence (see 'Fisheries').

Two large game sanctuaries are established. The Southern Reserve, which is beaconsed by cairns and iron standards, is bounded to north-east by the Uganda Railway from the Ngong to the Tsavo rivers; to north by a line following the Ngong river, the edge of Kikuyu forest, and Ngong hills to Mount Suswa, and thence due west to the Mau escarpment; to west by the Mau escarpment and left bank of the south Guaso Nyiro; to south by the southern border to the Tsavo river, and thence by the left bank of the Tsavo to the point where it approaches the Kyulu hills, and then by the eastern slopes of these hills and Makindu river to the railway. This reserve, much of which is waterless steppe suited only to a scattered pastoral population, ranges from 7,000 to 2,500 ft. in altitude. As it includes hills, thick bush, and in the south the open plains and swamps of the Nyiri desert, it gives scope for seasonal migrations. Until the outbreak of war its condition was very satisfactory. Over thirty different species of big game inhabited it. Eland, buffalo, wildebeest, giraffe, and ostrich were all increasing; and rhinoceros, though many were killed during the making of the Magadi railway, were still to be seen walking about the open plains. In 1914-15 it became the theatre of military operations, and many animals were shot for food, but the destruction will probably not be of permanent importance.

The Northern Reserve is bounded to north by a line running from Lolajonga hill to the summit of Mount Nyiro; to west by a line running from Mount Nyiro to the summit of Kowop hill and thence straight through the western scarp of Loroki

to the summit of Pakka hill ; to south by a line running from Pakka hill through the summit of Kuti to the junction of the north Guaso Nyiro and Uaso Narok, and thence by the left bank of the north Guaso Nyiro ; and to east by a line running along the summits of Lolajonga, Lodermut, and Lomoton hills, and then from the beacon on the west side of Mount Marsabit at the foot of the eastern slopes of the Mathew range, to the summits of Lololugi and Kalama, and so to the ford at Campi ya Nyama Yanga. The greater part is arid and lightly-bushed plain. Though not boasting the variety of animals found in the southern reserve, this area contains far more elephant, buffalo, rhinoceros, and greater kudu. It forms a feeder for the northern Guaso Nyiro district, one of the most shot-over regions in the protectorate. A reserve for eland and male roan only has been created in the Thika and Athi plains. It is bounded to north by Fort Hall, to east by a line running through Donyo Sabuk and along the boundary of the Machakos reserve, to Ulu ; to west by the Uganda railway from Ulu to Nairobi. A special licence, usually only given for scientific purposes, is required to hunt in the reserves.

MAMMALS

The mammals of East Africa may be divided, in a general sense, into the denizens of the forest, the bush, and the open plains. Such a classification, however, is only partial, since many animals are found at different seasons in different types of country, and others, when disturbed by man, change their habitat. Thus the remaining elephant and the buffalo, once frequenters of the plains, now hide up in thick cover, at any rate during the day. Other bush-dwellers have retreated to the forests ; and the forest animals themselves, in many instances, have retired from its fringe into its depths.

The undergrowth of the East African forests, which are mostly of the highland type, is not rich in fodder and can only nourish a limited number of creatures. Therefore, the principal forest-dwellers are tree-feeders. The baboon (*Papio ibeanus*), the beautiful Colobus monkey or guereza, the green monkey

(*Cercopithecus kolbi* and *C. k. hindei*), the Kikuyu race and the Kenya race, tree-hyraxes (*Procavia bettoni* and *P. crawshayi*), forest squirrels (*Paraxerus*), and dormice (*Graphiurus*) live in the branches; the elephant, bongo, bush-buck, bush-and forest-duikers, dikdiks, giant forest-hog, and bush-pig below. These eat mostly leaves, bark, twigs, and shoots: the bongo relishes bamboo, the pigs grub up roots. The leopard, common in all the forests, preys on the smaller bucks and apes, ascending on Kenya into the Alpine zone, where the mountain hyrax (*P. mackinderi*), and numerous rats and shrews are found. The forest animals are the most wary, difficult to stalk, and least known of all game. Many of their haunts are still inaccessible, and some of them, such as the bongo and giant hog—though probably numerous—are hardly ever shot by Europeans. Elephant in bamboo forest—their favourite haunt—give the most difficult and dangerous of all sport, but are now rare. Rhinoceros, especially if molested or when wounded, often retreat to the lower forest-levels from the plains.

Bush-country is intermediate between forest and open plain, and denizens of both may be found in it. By 'bush' is meant the dense thorn or acacia scrub which often borders plains and rivers and covers large areas of the nyika, the thickets of the parkland country, and elephant-grass jungles of the savannah; and generally thick cover where forest trees are absent. This is the favourite country for rhinoceros, buffalo, eland, and sable. Thick bush among rocky hills is the haunt of the greater and lesser kudu. In bush near water, water-buck, bush-buck, and impalla may be found. Baboons are common, and the Masai green monkey (*Cercopithecus pygerythrus johnsoni*) occurs in tall acacia bush, especially in the Sotik and Rift Valley. In certain seasons elephant may descend to the bush from the forest. The bush-pig is common, though seldom seen by day. Rats, mice, and shrews are plentiful. The papyrus swamps harbour the rare situtunga, and sometimes the buffalo. In the dense and waterless thorn-bush of the nyika, giraffe, oryx, gerenuk, Hunter's antelope, and

dikdik are the chief inhabitants. In the thorn country east of the Mathew range buffalo, rhinoceros, Grévy's zebra, and lesser kudu are also found. The principal carnivora of the bush are the leopard and serval (*Felis serval*) in thick country; the lion in more open districts. The civet (*Viverra civetta*) often hides up in thick cover, preying by night on poultry, game birds, rats, &c. Most dreaded by the game, though fortunately not common, are the packs of hunting-dogs (*Lycaon pictus*) which will attack all small, and even some large, antelope, and in settled districts prey upon goats and sheep. These are most numerous on the Nzoia river. As a rule, bush-game are wary and hard to stalk. They are little seen during the day, but often travel long distances to drink at night. Their scent and hearing are keen, and they are adepts at concealment.

The characteristic animals of the open plain are grass-feeding antelopes and zebra. These roam in large herds, often composed of several species, wherever the country remains undisturbed. On upland plains of undulating grassland, such as the Athi, Kapiti, and Loita, the common species are Grant's zebra, hartebeest, wildebeest, impalla, Grant's and Thomson's gazelle, and giraffe. Roan, eland, and reed-buck are more scarce and local. Baboons come down to the plains in large troops, hunting for bulbs and insects, and in cultivated districts do much damage to crops. Wart-hogs are common. Among the many small mammals, the extraordinary aard-vark or ant-bear (*Orycteropus afer*), living in burrows and feeding on termites, is common though seldom seen. The jerboa or jumping hare (*Pedetes surdaster*) is locally plentiful. It, too, lives in burrows, in large colonies, and is nocturnal. The white-tailed mongoose (*Mungos albi-caudus*), lesser mongoose (*M. sanguineus*), porcupine (*Hystrix galeata*), hedgehog (*Erinaceus albiventris*), and a multitude of rats, mice, and gerbils are found in the plains. On the arid nyika, where ground fodder often fails, grass-feeders are at a disadvantage compared with browsers able to crop the upper branches of the scrub. Here the chief species are the tall and

long-necked gerenuk, which is confined to certain well-defined districts, the giraffe, topi, oryx, the desert race of Grant's gazelle, and Kirk's dikdik. In north Jubaland and near Lake Rudolf the fauna resembles that of Somaliland, the chief types being the reticulated giraffe, topi, aoul, oryx, and Grévy's zebra.

The characteristic beast of prey in the open savannah is the lion, which is still fairly common. The cheetah and serval are also numerous, taking toll respectively of the smaller buck, and of rats and mice. The genet (*Genetta bettoni*) is less often seen. The spotted hyaena or fisi (*Hyaena crocuta*) appears to be decreasing, but the black-backed and silver jackals or bweha (*Canis mesomelas* and *C. variegatus*) are abundant, especially where mole-rats are plentiful. The hyaena-like aard-wolf (*Proteles cristatus*), eating chiefly termites and carrion, is indigenous but seldom seen, being of strictly nocturnal and subterranean habits.

Speaking generally, the herbivora of the plain are far less intelligent and alert than those of bush and forest. They roam in the open in a semi-tame state, seldom attempting concealment but relying for safety on sight, scent, and swiftness. Usually congregating in the middle of the plains when rain has been abundant and the grazing is good, they withdraw toward the foothills in drought. On the nyika, poor and scanty food stunts the stature of the larger antelope and checks horn development; and fine head are difficult to obtain. In this region the game is widely scattered so long as there is surface-water in the rainpans; but when these dry up vast herds assemble round the Lorian swamp and similar moist tracts, which then attract buffalo, elephant, and other bush animals. For further details of the larger mammals see Appendix.

BIRDS

The bird life closely resembles that of Uganda in its wide range of birds of prey, waders, and European migrants. Of these last over sixty are British species, twenty being among our tiniest and most delicate summer visitors. The principal game birds are francolins, guinea-fowl, sandgrouse, and

quail. There are ten species of francolin, extending from the coast to the Alpine zone. The little *Francolinus granti* is found in bush from Baringo to the coast; and *F. coqui*, a thick-set short-tailed bird, in open country from the coast to 60 miles inland, and up the Rift Valley. The Ulu francolin (*F. uluensis*) also frequents the Rift and Athi plains, near water. The chief highland species are the large *F. jacksoni*, 17½ in. long, found in thick bush and bamboo to 8,000 ft.; *F. kikuyensis*, on the escarpments; and *F. elgonensis*, ascending to 11,000 ft. on Elgon and Aberdare. Spur-fowl (*Pternistes infuscatus*) are abundant on the nyika, and so is the vulturine guinea-fowl (*Acryllium vulturinum*), which is perhaps the handsomest of the game birds, and useful for the pot. Reichenow's helmeted guinea-fowl (*Numida reichenowi*) is common everywhere; Pallas's guinea-fowl (*N. mitrata*) on the coast; and the Abyssinian species (*N. ptilorhyncha*) from Baringo northwards. Sandgrouse (*Pterocles*) flock on the river banks at dawn and dusk, and give excellent sport. Quails are abundant: the harlequin (*Coturnix delegorguei*) in the highlands, and the button quail (*Turnix lepurana*) on lower ground. The stone pheasant (*Ptilopachys fuscus* and *P. florentiae*) is local on stony hills. Pigeons and doves are innumerable. In dense forest is found the spotted wood pigeon (*Columba arquatrix*) and in more open woods the West African pigeon (*C. guinea*). The green pigeons, *Vinago nudirostris*, *V. wakefieldi*, and *V. delalandei*, are common in bush country; and the turtle dove (*Turtus semitorquatus*) and tiny Namaqua dove (*Æna capensis*) everywhere.

Birds of prey include five vultures, all of which are strictly protected. The commonest are the black vulture (*Otogyps auricularis*) the small brown *Neophron monachus*, and the African griffon (*Pseudogyps africanus*) which is found everywhere. The tawny eagle (*Aquila rapax*) is common; and the noisy fishing eagle (*Haliaetus vocifer*) which is protected, frequents the Rift lakes. Kestrels abound. The hen harrier (*Circus cyaneus*) and black kite (*Milvus korschun*) are plentiful in winter; the bold and greedy Egyptian kite (*M. aegyptius*)

and the hideous marabou stork (*Leptoptilus crumeniferus*) always and everywhere. Owls, all protected, range from the great eagle-owl (*Bubo lacteus*) to the wee scops (*Scops capensis*). The snake-eating secretary bird (*Serpentarius secretarius*) is not uncommon on high savannahs.

Only a few of the innumerable waders and other waterfowl which flock on the Rift lakes can be mentioned. They include pelicans, cranes, flamingoes, spoonbills, the Goliath (*Ardea goliath*), and other herons; saddle-bill (*Ephippiorhynchus senegalensis*), and other storks; glossy and sacred ibis (*Ibis falcinellus* and *I. aethiopica*). Coots (*Fulica cristata*), water hens (*Gallinula chloropus*), grebes (*Podicipes cristatus* and *capensis*), the spur-winged goose (*Plectropterus gambensis*), African mallard (*Anas undulata*) and many other duck are common. Between 15 and 20 species of duck breed on Lake Naivasha alone. Winter visitors include ringed plover and dotterel, ruff, whimbrel, curlew, pintail, shoveller, and garganey. On the wooded rivers the darter (*Plotus rufus*), wood ibis (*Pseudotantalus ibis*), pied kingfisher (*Ceryle rudis*), and cormorant are plentiful. The lily-trotter (*Actophilus africanus*) is the characteristic bird of swamps and lagoons. The greater and lesser bustard are both common.

Among birds of the plains, the ostrich is the most important. It differs little from the common South African race, but is of larger and coarser build. The feathers are equally good and sometimes superior. It is strictly protected, and eggs and young birds may only be taken by registered ostrich farmers and their agents. In the Mau and other forests of the escarpments and highland plateaux hornbills, both the great black and white *Bucorax caffer* and the smaller *Lophoceros*, are frequent. Turacos, though less various and magnificent than in Uganda, are represented by several forest species. There are six different parrots, but none are common. Whydahs and weaver-birds are plentiful, and destructive of grain. The beautiful king-whydah (*Chera delamerei*) is only seen on the high savannahs.

In the big-game districts the tick-birds (*Buphaginae*) and

cow herons (*Bubulcus lucidus*), which feed on the parasites infesting the larger animals, often frustrate sportsmen by warning their hosts of danger. The noisy and insistent honey-guide (*Indicator*) also spoils much good hunting, but if followed often shows the way to a hive.

Among the multitude of small birds are numerous brilliant sunbirds, glossy starlings, bee-eaters (*Merops* and *Melittophagus*), colies, tits, pipits, larks, and wagtails. The white-throat, wheatear, willow-, marsh-, and sedge-warblers are common winter visitors.

There is so far no general close-season for birds, but in some localities the wild fowl are protected. On Lake Naivasha there is a close season for waterfowl—from May 1 to October 14.

REPTILES AND FISHES

Crocodiles, ranging to 30 ft. or more in length, are common in the rivers and swamps, and some of the lakes, but do not occur in Naivasha. The giant monitor lizard (*Varanus niloticus*) is found in the same districts. There are over 40 indigenous species of snakes, but of these only 11 are venomous, 5 being cobras and 6 vipers. They are most common in the moist coastal plain, especially on the lower Sabaki river. The green mamba (*Dendraspis angusticeps*), ranging to 6 ft. 6 in. in length,¹ occurs in the extreme south, especially in Taveta, south Kiboko, Mombasa, and Kilifi, and on the Sabaki. The Uganda tree-cobra (*Dendraspis jamesonii*), olive in colour, replaces it in Kavirondo. Both are swift and exceedingly deadly, and are said sometimes to attack unprovoked. Two forms of 'spitting cobra' are found—the brown and gold *Naja nigricollis* occurs in the Lake Rudolf region, and *Naja haji*, a dull grey cobra about 5 ft. long, is fairly common in all parts of the Protectorate and especially between the coast and Nairobi. Both when attacked spit venom into the face of their enemy, which if it touches the eyes causes intense pain and temporary blindness. The best remedy is salad oil, which should be floated into the eye as promptly as possible.

¹ The same species reaches in South Africa a length of 12 to 15 ft.

Among vipers the puff adder (*Bitis arietans*), which is generally distributed, is by far the most deadly. It is lethargic and never attacks unprovoked; but may easily be trodden on unless a sharp watch be kept, as it is fond of lying stretched out on sunny paths, and sometimes in camps creeps into the blankets for warmth. It ranges to over 5 ft. long. The night adder (*Causus rhombeatus*), about 2 ft. long, occurs in the Nairobi and Kavirondo districts, but is chiefly dangerous to small animals. *Causus resimus*, an extremely venomous olive-grey viper 18 in. long, is found near the coast in the Witu and Lamu districts. The python (*P. Sebae*) or chatu, ranging to 23 ft. long, is the most important non-poisonous species, constituting a danger to domestic animals in some districts. Pythons are mostly found in swamps or near water, especially in the coastal zone.

Fish abound in the lakes and rivers. The baggara, or giant Nile perch (*Lates niloticus*), is found in Rudolf. In Victoria Nyanza the principal species are bream, barbel, catfish, mud-fish, and lung-fish or mamba (*Protopterus aethiopicus*). This grows to 5 ft. in length and is good eating, but its vicious biting propensities are much dreaded by native fishermen. Cyprinoid and other fish are numerous in the rivers, especially the Tana, Nzoia, Voi, and Tsavo, and give good sport with a rod. Large and small barbel, both good eating, take the hook freely on the northern Guaso Nyiro. Mkunga, an eel-like fish 4 or 5 ft. long, live under the boulders in the Voi. In 1905, trout were introduced into the mountain streams of the Aberdare Range. Loch Leven, Rainbow, and German Browns were all tried; the Loch Leven have done best, and now range to 6½ lb. in weight. The best trout fishing is in the Guru river at an altitude of 10,000 ft., and is preserved. A yearly licence costs Rs. 100, or for one week Rs. 25, and for a day Rs. 5. Domestic carp are being placed in the lower and more sluggish rivers, where they check the breeding of mosquitoes. It is also proposed to try them in the brackish lakes.

Many sorts of marine fish swarm off the coasts, especially

between Mombasa and Witu. Over 50 edible species are caught off Mombasa. Sharks are numerous all along the coast, and so are crabs, lobsters, and prawns.

The following are the chief marine sporting fish (tarpon tackle is required for the larger kinds) :

King-fish or *Nguru mtwana* (*Fam. Scombridae*). Very local ; common off Lamu Nov.-Dec., and at Malindi during monsoons. Usually up to 15 lb., but may run to 20 lb. or more.

Kambesi (*Caranx ignobilis*). Apparently the largest fish of the family, ranging to 120 lb. A smaller variety, *Koli-koli*, is the bayardo of the Sudan, and ranges to 64 lb. Good eating. Both are strong fighters, and most plentiful in the north-east monsoon

Barracuda or *Tengesi*. A fine fighting fish. The larger variety, or *Mzio*, ranges to 60 lb., and 5-6 ft. in length.

Bonito. A fine fighter, ranging to 50 lb. Only the smaller ones, 10 to 15 lb., are caught locally, usually after strong winds, and when sailing swiftly.

Tuna or *Albicore*. A deep-water fish, ranging to 30 lb. or more ; not common.

Pandu. A fine fighter, ranging to 20 lb.

Gar-fish. These are caught up to 4 ft. or more in length, at the entrance of Mombasa harbour. The long beak often inflicts nasty wounds. Very delicate eating.

Dolphin or *Fulusi* (*Coryphaena sp.*). These give good sport with a light rod, or may be caught by almost any swift-moving bait. They are most common off Tanaland in February and March, keeping well out to sea, and running up to 30 lb. weight.

Mkisi (mullet), *Nyuna*, and sardines are useful small bait fish ; the first always plentiful in muddy creeks, the others in open waters and bays, chiefly between March and November. For further information, see 'Fisheries'.

INSECTS AND OTHER PESTS

Blood-sucking flies and other small carnivora are an important and unpleasant feature of life, especially near the coast and on the lower ground. They decrease somewhat in

variety and ferocity as the highland plateau is ascended ; but in some upland districts deforestation, with a consequent reduction of bird life, has brought about a veritable plague of flies, beetles, crickets, and ticks.

Mosquitoes (Swahili, umbu) swarm, especially during the rains, near the rivers, lakes, and swamps below the 5,000 ft. line, becoming less plentiful above it, and apparently ceasing at 10,000 ft. In the moist coastal region their attentions make life almost intolerable ; a large *stegomyia*, which is said to bite through a canvas seat and a folded newspaper, being specially and deservedly unpopular. A hungry mob awaits chance visitors to the Lorian swamp. Anophelines are common, and in spite of preventive measures (see 'Health Conditions') are responsible for the continued prevalence of malaria in the coastal belt. One or more of the species conveying filaria are present on the Yala river in north Kavirondo, and in south Tanaland and Lamu.

The tsetse fly (*Glossina*) is locally common in the lowlands. *Glossina palpalis*, conveying sleeping-sickness, is apparently confined to the forest bordering Lake Victoria in south Kavirondo and to the banks of the rivers flowing into the lake. Cases now seldom occur and population is returning to the district. *G. palpalis* is also said to have existed near Mombasa, but the clearance of bush round the township has exterminated it. The avenues of trees now existing in the island of Mombasa create conditions favourable to the spread of tsetse. Several species of tsetse or ganda-fly, giving animal trypanosomiasis, are distributed along the coast and up the rivers of the coastal plain. The most common is the large brown *Glossina brevipalpis*. Not much is known of its disease-carrying powers. *G. pallidipes*, closely allied to *morsitans*, infests the Mombasa coast belt and the Uganda Railway, where it ascends to 3,000 ft. and also the Jubaland rivers. It gives cattle trypanosomiasis, and is the principal host of the deadly camel disease of Jubaland. In the dry season it is confined to dense bush near water ; but in the rains may penetrate half a mile or more inland. *G. fusca* inhabits the

west bank of the Amara river, ascending to 5,200 ft., the greatest known altitude for *Glossina*. It causes a few deaths among stock, but the loss traceable to it is unimportant. *G. longipennis* is found in places far removed from water, and is known as the desert tsetse.

The principal known fly-belts are : on the Uganda Railway between Mombasa and Makindu ; on the west bank of the Amara river in the south Masai Reserve ; along the coast, from the German frontier to Malindi ; the upper Sabaki river ; the forest between Witu and Port Durnford ; the Arnole river and neighbouring lagoons. On the Juba river tsetse swarm after the rains the whole way from Dolo to the sea, save in the district between Dakach and Serenli, which is fly free and—except during, and 4 weeks after the rains—forms a safe camel route. The upper Tana river, the northern Guaso Nyiro from the Lorian swamp to longitude $37^{\circ} 45'$ east, and a strip running from this point north to Marsabit are also infested with fly. All these areas are unsafe for horses, camels, and cattle ; but thanks to their careful definition and the system of permits controlling all movements of stock, cases of animal trypanosomiasis are becoming rare, and can generally be traced to imported animals. Cattle can best be passed through the fly belts at night, as the tsetse generally bites during the day ; though some species attack at night when disturbed. It is said to be most active before 9 a.m. and after 4 p.m. ; but in the cool weather it also feeds at mid-day. Smearing the stock with liquid cow-dung is said to be a great preventive, but skin-dressings are of little avail, as the tsetse drives its long proboscis deep below the skin into the larger blood-vessels. Tsetse are attracted by swiftly moving objects, and have been known to pursue a cyclist for miles. They are occasionally brought by the train to Nairobi and Naivasha.

Bot-flies (*Oestridae*), gad-flies (*Tabanidae*), cattle-flies (*Stomoxys*), and other blood-suckers are numerous. The big game of the plains, and sometimes the lambs and other young stock, suffer much from bot-flies, which deposit their eggs

in the nostrils and other soft parts, causing painful swellings. Gad-flies are most abundant during and after the rains. As they need little shade, their distribution is wider than that of the tsetse. They probably play a large part in the spread of trypanosomiasis, by direct inoculation from diseased to healthy stock. The forests west of the Juba from the Seyera swamp to the sea are infested by the maddening *Tabanus africanus*, and Witu and the lower Sabaki, by the large *Tabanus latipes*, recognizable by its barred wings. Both appear to convey camel and cattle-sickness. The feeding times of the gad-fly are the same as those of the tsetse. As it prefers the neighbourhood of water, camps are best pitched a quarter of a mile at least from rivers and pools in infested neighbourhoods, where its persistent attacks quickly madden both men and beasts. Other flies which come under suspicion are *Lyperosia*, found in the desert as well as near water, and *Haematopota*, which has similar habits to *Tabanus*. The highlands have their own insect pests. Dense clouds of *Haematopota alluaudi* annoy the traveller in Kenia and other mountain forests up to 9,000 ft. Above this line their place is taken by the small *H. distincta*, ascending to 13,000 ft. Throughout the plains and forests up to 10,000 ft. wild bees (nyuki) are common and often vexatious, as they are apt to be savage if disturbed. In many districts they are partially domesticated by the natives, who set honey-boxes for them in the woods. Carpenter-bees are common, and very destructive of fence-posts and other woodwork. Wasps of several species abound in the tropical regions. Termites are universally found in the open country, and must always be reckoned with where constructional timber is placed in contact with the ground. In the lowland forests the siafu, or ferocious red driver-ant, inspires just respect. Should an advancing column of these be encountered, salt or red-hot embers must be scattered in their path. They devour everything they meet, and fasten eagerly on human flesh, breaking up any camp or safari which they attack. Smoke and heat are also the best remedies against

the small ants (tungu), myriads of which may invade the stores when on trek. The disgusting 'stink ant,' an inch in length, is found in Kavirondo and elsewhere. The insects threatening the plantations and field crops are many, and are dealt with by special legislation (see 'Resources'). Among the most destructive are the coconut-beetle (*Oryctes monoceros*) widespread on the coast plain, where it has seriously affected the copra industry, the coffee-bug (*Antestia variegata*), the citrus moth, which attacks oranges and lemons, and the wheat-aphis (*Toxoptera graminum*). Cut-worms do much harm to coffee, tobacco, potatoes, and maize.

Animal parasites are also numerous. Ticks infest the big game to an almost incredible extent, especially in the Athi and Kapiti plains, forming great rims round the eyes and horn-sheaths and massing in bunches on the softer parts. They frequently attach themselves to unwary hunters and travellers. The brown tick (*Rhipicephalus appendiculatus*), the conveyer of East Coast cattle-fever, is unfortunately common, and until the practice of dipping all stock was established made this disease a standing menace to the stock-farming industry. For a further discussion of disease-bearing insects and parasites see 'Health Conditions'.

APPENDIX

LIST OF BIG GAME ANIMALS

English and Swahili names

Primates

Colobus Monkey or *Mbega*.—The beautiful black and white colobus or white-tailed guereza (*Colobus caudatus*) is fairly common in the upland forests, especially on Nandi, Mau, and Kikuyu escarpments; but is less plentiful on the Aberdare range. It also occurs in the forests of Kilimanjaro, Elgon, and Kenya, ascending to 9,000 ft. The colobus is entirely arboreal in its habits and very difficult to approach. Its flesh is eaten by some tribes, and its fur is greatly valued. So far only the black and white species has been reported from British East Africa, though the Uganda variety (*C. matschiei*) may occur. Six of each species may be shot by holders of a Sportsman's or Resident's licence.

Ungulata

Elephant or *Tembo*.—Shoulder height about 11 ft. Elephant once ranged

the whole country ; but are now never found in the open by day, and are so reduced that they are confined to a few patches of thick bush and forest, from which they fear to roam. They are chiefly found in the forest areas of Kenya, Aberdare, Elgon, and Meru, sometimes wandering north to the Uasin Gishu and Baringo or west to Mau. In dry weather they live high up, in and above the bamboo zone, ascending to 10,000 ft., but in the rains descend to the dense forest for shelter. They sometimes raid native crops at night, and on the lower slopes of Kenya and Aberdare feed on the masasumua bush, of which they are very fond. At certain seasons they may be found on the lower Sabaki, about three days inland from Malindi, on the lower Tana near Witu, in Jubaland south of the Lakdera, and in the Lorian swamp. The Northern Reserve is satisfactorily stocked with them. In the Southern Reserve elephants exist in the Tsavo district, and also visit the Nyiri swamp from Kilimanjaro. During the military operations of 1914-15 a number were seen in the Matapato country and near Kiu, where they seem to have been increasing during the last few years. Elephants, which are among the most wary and savage of game animals, are best hunted during the spring rains, when they descend to the bush levels to feed. In the bamboo zone their pursuit is difficult and dangerous. The best ivory is found in the highlands. It is fine and close-grained. Tusks from the coast are small and poor. The meat, though tough, is much liked by natives. The heart is the best eating. The destruction of the nerve of the trunk should be allowed, as all natives believe it to have magic and fatal properties. Elephants may only be killed or captured by special licence ; for one, Rs. 150, for two, Rs. 450. Those bearing tusks under 30 lb. are absolutely protected. Sportsmen failing to obtain a second elephant are entitled to a refund of Rs. 300 on surrender of licence. Their increasing rarity may be gauged from the fact that even in 1911, of 159 allowed under 116 licences, only 41 were killed.

Rhinoceros or *Kifaru*.—Shoulder height, 5 ft. Length up to 12 ft. Anterior horn to 40 inches, but often only 10-12. The black rhinoceros (*R. bicornis*) is widely distributed in the plains, especially in the parkland and thick thorn bush ; but is never found more than 10 miles from water. It is absent from the Kavirondo district and the coast belt south of the Sabaki. In the Southern Reserve it may still be seen walking about on the open plains in the Nyiri swamp. It is also fairly numerous northwards on the wooded slopes of Ngongo and Kedong, in the Ithanga hills, on the Thika, and upper Tana. A smaller race, similar to the Somaliland type, ranges north from Baringo to Lake Rudolf and extends eastwards along the northern bank of the Guaso Nyiro. It has recently become so numerous in the Northern Reserve as to constitute a nuisance. Elsewhere, however, and especially in settled districts, the rhinoceros is quickly decreasing. It appears to have been expelled from the Athi plains and Rift Valley. Rhinoceros are dangerous and destructive, and will sometimes charge unprovoked, but are clumsy and short sighted, their range of vision being

only about 35 yards. One may be killed or captured under a Sportsman's or Resident's licence.

Grant's Zebra or *Punda milia*.—The East African or Grant's race of Burchell's Zebra (*Equus burchelli granti*) is one of the commonest animals of the plains, ranging from the western and southern boundaries of the Protectorate north to Lake Rudolf and east to the eastern edge of the highland plateau. This race does not descend below the 3,000 ft. line. On the coastal plain from Kilimanjaro and the southern boundary to the Tana, and inland to the edge of the nyika, its place is taken by the slightly larger *E. b. bohmi*. Zebra constantly associate with hartebeest and giraffe. They are normally quiet, but when stampeded by lion or wild dog will rush through anything, and are very destructive of fences in settled districts. They form the lion's favourite food. Zebra steak is strong, but eatable. The rank yellow fat under the skin is much appreciated by natives.

Twenty may be shot under a Sportsman's or Resident's, and up to four under a Traveller's licence.

Grévy's Zebra or *Kangaja*.—Shoulder height, 48–52 in. This large Abyssinian species (*Equus grevyi*) ranges eastward from Lake Rudolf through the northern Guaso Nyiro drainage, but is not found east of the Lorian swamp, or in the interior of the nyika. It prefers open bush country, is swift and very wary, and constantly associates with the oryx beisa herds. The stripes are intensely black, on white or cream ground.

Two may be shot under a Sportsman's or Resident's licence.

Buffalo, *Mbogo*, or *Nyati*.—Shoulder height (bulls), 5 ft. Length, including tail, 10½ ft. Buffalo, at one time among the commonest East African animals, were nearly exterminated by rinderpest in 1890, when only about one in 10,000 survived. They are now recovering in some districts, but are seldom seen in the open during the day. Two races are indigenous. The East African type (*Bos caffer radcliffei*) ranges from the western frontier eastward to the coast and north to the northern Guaso Nyiro and Lake Sugota. It has a black coat, shaggy in the mountain herds, and immense horns, 34 to 48 ins. on the inside curve, with a spread of 44–52 in. It is found near dense cover, on the edge of mountain forests or in elephant grass and papyrus swamps, where it lies up during the day. On the slopes of Kenya, Mount Uaraguess, the Ithanga, Ngongo, and Mathew hills, the Kedong valley and the southern border north-west of Lake Natron, it lives in the forests, sometimes ascending to the alpine zone. It is not found north-east of the Tana. The Sudan race (*B. c. aequinoctialis*) with flatter horns, averaging 25 in. on the inside curve with a 31 in. spread, is fairly numerous on the eastern shore of Lake Rudolf. Buffalo are probably the most dangerous of all big game. They have keen sight and scent, and often charge unprovoked.

Two bulls may be shot under a Sportsman's or Resident's licence.

Coke's Hartebeest or *Kongoni*.—Shoulder height, 48–49 in. Weight, 300–350 lb. Three races of this hartebeest occur in the Protectorate. The

type form (*Bubalis cokei cokei*) is abundant on the open plains from the edge of the highland plateau east to the Tana and south to the southern frontier, but not in the moist coast belt. One of the commonest game animals. Herds average 25. Often associates with zebra, and is very destructive of fences and crops. Much preyed on by lions. Horns average 16–20 in. Spread between tips 13 in. Weight about 300 lb. The highland race (*B. c. kongoni*) is larger and less russet in colour. It ranges from Kenya and Lake Naivasha south and west to Makindu and the Loita plains. The horns average 16–18 in.; tip spread 12–14 in. The Rift Valley race (*B. c. nakuræ*), ranging eastwards from Lakes Baringo and Nakuru to the Aberdare foothills, is sometimes regarded as a form of Neumann's hartebeest, which it closely resembles. Horns, 18 in., curving inward. Tip spread 8 in.

The meat of Coke's hartebeest is hard and coarse. Twenty (probably excluding *nakuræ*) may be shot under a Sportsman's or Resident's licence, and up to five under a Visitor's licence. They are swift, with great staying power, and hard to shoot.

Neumann's Hartebeest.—Shoulder height, 48–50 in. Horns, 15–22 in. Tip spread, 8½–10 in. The true Neumann's hartebeest (*Bubalis neumanni*) appears to be confined to the north and east shore of Lake Rudolf, where only a few specimens have yet been obtained. It has a darker back and more spreading horns than *nakuræ*, which is often confused with it.

Two may be shot under a Sportsman's or Resident's licence, except in the game preserves. This number probably includes specimens of *nakuræ*.

Jackson's Hartebeest.—Shoulder height, 52 in. Weight, 400–500 lb. This hartebeest (*Bubalis lelwel jacksoni*) frequents rolling downs 5,000 to 8,000 ft. in altitude, chiefly the highlands from Elgon to the Mau escarpment between 2° N. and 2° S. lat. It is a darker, richer red than any other species, and has a black chin and tail tuft. Horns about 22 in. Tip spread, 4–14 in. Another race, with lighter coat and wider spread horns, ranges from Baringo east to Mount Kenya, and north to the Lorogi hills, but is not common. Four may be shot under a Sportsman's or Resident's licence, and up to five under a Visitor's licence.

Topi.—Shoulder height, 48–52 in. Horns, 13–20 in. Weight (bulls), 280–380 lb. The topi (*Damaliscus corrugum jimela*) is locally distributed in the open plains, often associating with zebra and hartebeest. It is found west of the Rift Valley from the headwaters of the Turkwel to the southern frontier, on the Tana river from the equator to the coast, and generally in Jubaland south of the Lak Dera. The topi is one of the swiftest animals of the plains and very tenacious of life. The red-brown coat, being counter shaded, is very conspicuous, and has a silky gloss. Under parts cinnamon. Meat excellent.

Under a Sportsman's or Resident's licence eight may be shot in Jubaland, Tanaland, and the Loita plains; two elsewhere. Under a Visitor's licence one in above districts only.

Hunter's Antelope or Arrola.—Shoulder height, 48 in. Horns on curve

to 27 in., the first 12 being heavily annulated. Between tips, $10\frac{1}{2}$ in. Long tail, up to 18 in. Dark ear tips. Colour uniform pale coffee; old bulls slate. White chevron, belly, and tail tuft. This rare species (*Dama-liscus hunteri*) is found on the grassy plains and open bush of Tanaland east of 40° E. longitude, and south of $0^{\circ} 35'$ S. latitude. The herds, 20 to 30 strong, are usually found far from water, and lie up in thick acacia bush during the day. When alarmed they often migrate 10 or 20 miles.

Six may be shot under a Sportsman's or Resident's licence.

Wildebeest or *Nyumbu*.—Shoulder height (bulls), to 46 in. Horns to 29 in. Maximum spread, 25 in. The East African wildebeest, or white-bearded gnu (*Connocoetes taurinus albojubatus*) is found on open grass plains, chiefly the Loita, often herding with zebra and hartebeest. It is extremely shy and wary, and often savage when wounded; and rapidly disappears from settled districts, as it cannot tolerate the neighbourhood of man.

The type race ranges from the Ithanga hills and Athi plains south through the highlands of the coast drainage to Kilimanjaro. A variety (*mearnsi*) smaller, with darker legs and more downward curving horns, abounds at certain seasons on the Loita plains between Mount Suswa and the southern border, whence it migrates into Tanganyika Territory.

Three may be shot under a Sportsman's or Resident's licence, and one under a Visitor's licence.

Bush Duiker.—Shoulder height to 25 in. A solitary little antelope found in and near thick cover, browsing on twigs and leaves, especially nightshade and wild olive. Duiker are easily tamed and make delightful pets, but are destructive and have a passion for roses. There are four distinct races in the Protectorate.

(a) The Uganda race (*Cephalophus grimmii nyansae*) from the Mau escarpment to the west edge of the Rift Valley. Small short ears. Horns, $4\frac{1}{4}$ in.

(b) The mountain race (*C. g. altivallis*) in the alpine meadows and heath zone of Kenya and Aberdare from 9,000 to 11,000 ft. altitude. Dark shaggy coat, long ears. Horns, $4\frac{1}{4}$ in. Eats alchemilla. (c) The desert race (*C. g. deserti*) in the nyika lowlands, from the southern border to the Tana, and inland to Kenya. Light ochre-buff. Horns, $4\frac{1}{2}$ in. (d) The Athi race (*C. g. hindei*). From the north slopes of Kenya and the northern Guaso Nyiro south through the high grasslands to the southern border. Short coat.

Not protected.

Isaac's, or *Highland Red Duiker*.—This species (*Cephalophus ignifer*) inhabits the highland forests to 7,000 ft. or more above the sea, from Kenya through the Kikuyu and Mau escarpments to Elgon. Colour bright rufous, dark legs, fine glossy coat. Medium size. Horns, $1\frac{7}{8}$ to 4 in.

Ten may be shot under a Sportsman's or Resident's licence.

Harvey's Kilimanjaro Red Duiker or *Nuno*.—This species (*Cephalophus harveyi*) closely resembles the preceding, but is smaller, with a black forehead and stouter horns. Forests of the Kilimanjaro district, and coast from Juba river to the southern frontier.

Ten may be shot under a Sportsman's or Resident's licence.

Blue Duiker.—Shoulder height 12 in. Horns $1\frac{1}{2}$ in. The blue duiker of the Rift Valley (*Cephalophus monticola musculoides*) ranges from the summit of the Mau escarpment west to Elgon and south to the railway at Muhoroni. It lives retired in the depths of the forest, and is hardly ever seen. Natives trap it for the skin. General colour slaty brown. Dark legs and rump, white tail-tuft.

A coast race (*C. m. hecki*) ranges north in the forests from Mozambique to the Witu district. It has pure white under parts and bushy white tail. Very rare.

Ten blue duikers may be shot under a Sportsman's or Resident's licence.

Klipspringer.—Shoulder height 18–22 in. Horns 4 in. Two races are found in the Protectorate. The Masailand type (*Oreotragus oreotragus schillingi*) is distinguished from all others by the presence of horns in the female. Thighs lighter than the body colour. Locally distributed on barren rocky hills 3,000–9,000 ft. altitude from Kenya and the north edge of the highland plateau to the southern frontier, and east to Kitui and Makindu. The northern type (*O. o. aureus*) ranges from Kenya and the north bank of the Tana to Lake Rudolf and Elgon. Uniform golden body colour, white beneath.

Meat excellent.

Ten may be shot under a Resident's or Sportsman's licence, and up to five under a Traveller's licence.

Highland Oribi or *Taya* (Swahili for all oribi).—Shoulder height 22 in. Horns 5 ins. This race (*Ourebia montana cottoni*) is a variety of the Abyssinian species, found abundantly on the lofty grasslands of the Uasin Gishu and Mau escarpment. Marked by its thick tawny coat and large ringed horns. It likes cover, but roams the open plains when the grass is burnt; is alert and swift, and a difficult mark. Meat excellent.

Ten may be shot under a Sportsman's or Resident's licence.

Kenya Oribi.—Shoulder height 22–25 in. This race (*O. m. Kenyae*), marked by its long tawny coat and tufted black tail, occupies a small area from Kenya to the Ithanga hills, west to Fort Hall, and east to Embu. A black-tailed form, probably identical with it, is said to be plentiful on the lofty grasslands of Kavirondo.

Ten may be shot under a Sportsman's or Resident's licence.

Haggard's or *Coast Oribi*.—A black-tailed short-haired race found on the backlands of the coast from the Tana to the southern frontier and inland to the eastern edge of the nyika.

Ten may be shot under a Sportsman's or Resident's licence.

Steinbuck or *Ishah*.—Shoulder height about 22 in. Ears $4\frac{1}{2}$ in. Horns $3\frac{1}{2}$ – $4\frac{1}{2}$ in. The Masailand steinbuck (*Rhaphicerus campestris neumanni*) is plentiful in bush and long grass on the highland plateau from Elgon, Baringo, and Kenya to the southern boundary, ranging from 3,000 to 9,000 ft. It is usually solitary, shy, and takes cover readily. Coat bright sorrel red.

Ten may be shot under a Sportsman's or Resident's, and up to five under a Traveller's licence.

Pigmy Antelope, Suni or Paa.—Shoulder height 13-14 in. Horns $2\frac{1}{4}$ in. The rare highland race of suni (*Nesotragus moschatus akeleyi*) occurs in the deep forests of Kenya, Aberdare and the Kikuyu escarpment, between 6,000 and 7,000 ft. It is solitary, very shy, and swift, and seldom emerges from the dense undergrowth. The coat is chestnut brown, thick, with white throat and underparts. The desert race (*N. m. deserticola*) inhabits dense thorn bush in the nyika, from the Tana to the southern boundary. Cinnamon-rufous coat, short hair.

Ten suni may be shot under a Sportsman's or Resident's and up to five under a Traveller's licence.

Kirk's Dik-dik or Paa.—Shoulder height about 13-14 in. Weight 10-12 lb. Horns 3 in. Three races of this dik-dik are found in the Protectorate. The type and smallest form (*Rhynchotragus kirki kirki*) is common in sandhills on the Jubaland coast, ranging south to the Tana. The nyika race (*R. k. nyikae*) extending throughout the nyika from the Tana to Kilimanjaro and inland to an altitude of 2,500 ft., is larger and lighter in colour. The desert race (*R. k. minor*) is found in Jubaland north of the northern Guaso Nyiro, and east as far at least as the Lorian swamp. Small, with pale coat. All prefer thick bush and are rarely seen. Meat white and delicate.

Ten may be shot under a Sportsman's or Resident's, and up to five under a Traveller's licence.

Hinde's Dik-dik.—A higher form of Kirk's dik-dik (*R. kirki hindei*), larger than the coast and desert races. Horns $2\frac{3}{4}$ in. Dark coat, with tawny sides. Athi plains and foothills from Kenya to Kilimanjaro, between 2,500 and 5,000 ft.

Ten may be shot under a Sportsman's or Resident's, and up to five under a Traveller's licence.

Cavendish's Dik-dik. This species (*Rhynchotragus cavendishi*) is the largest of the *kirki* group. Horns $3\frac{3}{8}$ in. It ranges the Rift Valley from Baringo southwards, the Loita plains, and upper Amala river.

Ten may be shot under a Sportsman's or Resident's, and up to five under a Traveller's licence.

Guenther's Dik-dik.—This long-snouted species (*Rhynchotragus guentheri smithi*) ranges Turkhana and Jubaland eastwards to the Lorian swamp. It is larger than *kirki*, of a general pepper-and-salt-colour.

Ten may be shot under a Sportsman's or Resident's, and up to five under a Traveller's licence.

Common Waterbuck or Kuru.—Shoulder height, 43-48 in. Weight to 360 lb. Horns, 26-30 in. The waterbuck (*Cobus ellipsiprymnus*) is found on open plains near water, in the highlands and near the coast. The highland race (*C. e. thikae*), with light brown coat, ranges south from the northern Guaso Nyiro through the Rift Valley, and east along the Tana and

the flanks of the highlands. The Swahili race (*C. e. Kuru*), with dark sepia coat, inhabits the coastal plain from the Tana south, and the southern border from the sea to Kilimanjaro. The meat is rank and unpleasant, but natives enjoy it.

Two may be shot under a Sportsman's or Resident's licence.

Defassa Waterbuck.—Shoulder height, 48 in. Horns, 25 to 30 in. Weight, 380–500 lb. Distinguished from the last by its shaggy coat and white rump. Found chiefly in herds on wet grass plains, or in papyrus swamp. The highland race (*Cobus defassa nzoiae*), with a heavy dark red coat, ranges from Elgon to the east edge of the Mau escarpment and north to the hills west of Rudolf. The Laikipia race (*C. d. tjaderi*), smaller and darker, replaces it on the Laikipia plateau, extending south to Mount Suswa at least. The Rudolf race (*C. d. matschiei*), with a greyish drab short coat, inhabits the south-west shore of Rudolf between the Turkwell and Kerio. The Nyanza race (*C. d. raineyi*), large, with cinnamon-drab coat, inhabits Nyanza province south of the railway.

Two may be shot under a Sportsman's or Resident's licence.

Uganda Cob.—Shoulder height, 35 in. Horns, on curve, 16–20 in. Spread, 14 in. Weight, 250 lb. The Uganda cob (*Cobus thomasi*), distinguished from *defassa* by its golden tawny coat, is found in open grassland near water on the Uasin Gishu plateau, ranging north to Lake Rudolf. Herds seldom exceed 20 or 30; the sentinels are fond of perching on termite hills.

Two may be shot by holders of a Sportsman's or Resident's licence.

Reed-buck or *Tohi*.—Shoulder height, to 30 in. Horns, 10 in. on curve; 9½–10 in. spread. Weight, 80–90 lb. Two races of reed-buck (*Redunca redunca*) can be distinguished. The highland or Uganda type (*R. r. wardi*), with long dark coat and sharply pointed horns, ranges the highlands from the Turkwel, south and eastwards to the headwaters of the Athi and Tana, ascending to 7,500 ft. It is specially plentiful on the Uasin Gishu and Mau plateaux, and the Athi plains near water. The Swahili race (*R. r. tohi*)—rare and local—occurs in the moist coast zone from the Tana river to Kilimanjaro, but not on the nyika. It is smaller than *wardi*, with a short tawny coat and small pointed horns. The meat of both races is excellent.

Ten reed-buck may be shot under a Sportsman's or Resident's, and up to five under a Visitor's licence.

Chanler's or *Rock Reed-buck*.—Shoulder height, 28 in. Horns, 6 to 7 in., spread, 5½ in. Smaller than *wardi*, with drab body, ochre head, and white under parts. Found in small parties on stony hills and grassy slopes from Lake Rudolf south to the southern border, and east to about 38° E. longitude, especially on the Athi and Loita plains. Very shy and agile; excellent sport. Good eating.

Ten may be shot under a Sportsman's or Resident's, and up to five under a Traveller's licence.

Impalla. Shoulder height, 34–38 in. Horns, to 30 in.; tips close together in young animals, and separating with age. Females hornless.

Weight, 130–160 lb. The impalla (*Æpyceros melampus suára*) is common on watered plains near bush, especially south of 1° N. latitude, but is absent from the coast belt, forests and nyika. Its chief centre is the Rift Valley, ranging north to the Suk mountains and south to the southern border. The finest heads come from the northern Guaso Nyiro. During the last ten years it has increased enormously, especially in the Southern Reserve and near Nairobi, and its herds may often be seen grazing with waterbuck. It is one of the handsomest East African antelopes, with striking russet and white coat and annulated horns. Very shy and swift, taking extraordinary bounds into the air when alarmed. Good eating.

Four may be shot under a Sportsman's or Resident's, and one under a Traveller's licence.

Thomson's Gazelle. — Shoulder height, 25–27 in. Horns, 13–15 in. Weight, 48–58 lb. The 'Tommy' (*Gazella thomsoni*) is one of the most abundant animals of the lofty plains, having approximately the same range as Coke's hartebeest. It is not found where the grass is long and rank, or in arid regions. The sandy red coat has a conspicuous dark side stripe, 2–4 in. wide. The type race (*G. t. typicus*) is found on the south frontier, between Taveta and the southern Guaso Nyiro. The black-nosed race (*G. t. nasalis*) spreads from the Loroghi mountains through the Rift Valley to the Loita plains, and east to Kenya and Makindu. 'Tommies' go in herds, 20 or 30, or even 50 strong, are grass feeders, and very tenacious of life. They are extremely destructive of young crops, especially wheat. Meat excellent.

Ten may be shot under a Sportsman's or Resident's, and up to five under a Traveller's licence.

Grant's Gazelle.—Shoulder height, 34 in. Massive lyrate horns, 20–28 in. on curve, spread, 12–16 in., females much less. Weight, 150–165 lb. One of the largest and handsomest gazelles; plentiful on open plains, often associated in herds with Tommies and hartebeest. Coat cinnamon with white rump. Females and young have dark side stripe. The numerous races can be classified under four types: (a) the type race (*Granti granti typicus*), sometimes called *roosevelti*, dark, with upright horns, inhabits the Rift Valley east of 36° E. longitude, upper Tana, Athi plains, and Southern Reserve; (b) Robert's Gazelle (*G. g. robertsi*) marked by peculiar widespread horns and the absence of side stripe in females, inhabits the Loita plains and southern border from Lake Victoria to 36° E. longitude; (c) Bright's Gazelle (*G. g. brighti*) is found in the Turkhana district. It has a light coat, no side stripe, and small upright horns; (d) Rainey's Gazelle (*G. g. notata*) closely resembles *brighti* but has a darker coat and more spreading horns, and a large conspicuous rump-patch. A variety with deeper colouring and broad side stripe is reported from the Loroghi mountains. The race is distributed through Jubaland and along the north-east Tana, north to Abyssinia and beyond, and east to the Lorian swamp and beyond. It appears almost independent of water, frequenting desert

scrub and stony hills. In south-east Jubaland it is probably crossed with Peter's Gazelle (see below).

Three each of the above four races may be shot under a Sportsman's or Resident's, and one of any one race under a Traveller's licence.

Peter's Gazelle.—Horns to 21 in., very upright. Spread, 6–8 in. This form (*Gazella petersi*) is now usually considered a variety of *granti*, marked by its small size, and smaller rump-patch, which is divided by a broad cinnamon stripe. It inhabits the coast of Jubaland from the Taru desert northwards. Meat excellent.

Ten may be shot under a Sportsman's or Resident's licence.

Soemmering's Gazelle or *Aoul*.—The aoul, or ariel of the Sudan (*Gazella soemmeringi*) is a Somali type, which is found in the Lake Rudolf district and north-east Jubaland, in the same country as oryx. It has a sandy coat and large white rump-patch. The tips of the horns are bent sharply inwards. A race intermediate between this and *Granti notata* occurs in the Rendile country.

Ten may be shot under a Sportsman's or Resident's licence.

Waller's Gazelle or *Gerenuk*.—Shoulder height, 36–41 in. Neck almost equalling body length. Massive horns, 14 in. Weight, 115 lb. The gerenuk (*Lithocranius walleri*) is the commonest game animal of Jubaland. Its curious long legs and neck distinguish it from all other species. The Swahili call it 'little camel'. It is distributed in small herds in desert scrub through the nyika, ranging north to Abyssinia and west to Lake Rudolf, usually far from water and often associated with oryx. Feeds on twigs and leaves. Very shy. Meat poor: few natives will touch it.

Four may be shot under a Sportsman's or Resident's, and one under a Traveller's licence.

Oryx Beisa or *Chiroa*.—Shoulder height, 48 in. Horns, 32–40 in. Weight, 450 lb. The common oryx inhabits the nyika, north and east of the Tana and north of Kenya and Baringo, often associating with zebra, giraffe and Waller's and Grant's gazelles. The coat is pale grey-drab with black markings. Horns upright. Oryx are bold fighters, and may be vindictive when wounded. Meat excellent.

Four may be shot under a Sportsman's or Resident's, and one under a Traveller's licence.

Fringe-eared Oryx.—This variety (*Oryx beisa callotis*), marked by the black ear-tassels, occurs locally in the south-west nyika, from the Tana to the southern border, and in the Southern Reserve. Herds are known south of Suswa, at Lakes Magadi, Natron and Jipe, near Makindu, and at the Taita hills.

Two may be shot under a Sportsman's or Resident's licence.

Sable Antelope or *Pala-hala*.—Shoulder height, 54 in. Horns on curve (male), 32–40 in. The sable (*Hippotragus niger*) is one of the most magnificent of all antelopes. In East Africa it is rare and local, found only on grassy uplands in the Shimba hills south-west of Mombasa, and other points

between the railway and the southern border. Only males develop the black or deep brown coat in this region, females being russet. The herds number 10 to 50, and are in full coat after the rains (May). Sable are very courageous, and often dangerous when wounded.

One male may be shot under a Sportsman's or Resident's licence. Females protected.

Roan Antelope.—Shoulder height, 57 in. Horns (male), 25–39 in. The roan (*Hippotragus equinus*) is rare and local. It occurs in small isolated herds in the Ithanga hills, Loita plains, Athi plains, and on the crest of the Mau escarpment. In the two latter areas and the Rift Valley south of Baringo, it enjoys absolute protection. Very savage when attacked, and may charge when wounded.

Except in above areas, one male may be shot by holders of a Sportsman's or Resident's licence.

Eland or *Mpofu*.—Shoulder height, 60–69 in. Horns, 25–31 in., spread about 12 in. The East African eland (*Taurotragus oryx pattersonianus*), which is somewhat smaller than the South African race, was almost exterminated by rinderpest in 1896, and further reduced by gastro-enteritis in 1909, but is quickly recovering under protection. It is extremely migratory, and the herds, 50 to several hundred strong, are met on dry open plains from the northern Guaso Nyiro to the southern border. They range east to the Tana, and ascend to 8,000 ft. Eland are very docile, and might be domesticated, but as draught animals seem to lack staying power. The meat is tender and juicy.

In the Rift Valley south of Baringo, Uasin Gishu plateau, south of the Nzoia river, and in the Athi plains eland are strictly protected. Elsewhere, one may be shot under a Sportsman's or Resident's licence.

Bongo or *Marua*. Shoulder height, 48 in. Horns, 25–35 in. The bongo (*Boocercus eurycerus isaaci*) is found only in dense highland forests above 6,000 ft., keeping principally to bamboo jungle, through which it can run at surprising speed. It is shy, wary, and most difficult to kill, though conspicuously coloured; having a bright russet coat with 10 to 13 vertical white body stripes. Its chief haunts are the forests of Kenya, Aberdare, Elgon, and the Mau and Kikuyu escarpments. Frequently trapped by natives for its skin.

Two may be shot under a Sportsman's or Resident's licence.

Bushbuck or *Mbawara*.—Shoulder height, 30–35 in. Horns (male only), 10 in. Weight, 100–170 lb. The bushbuck (*Tragelaphus scriptus*) is generally distributed in thick bush and forest; but though fairly common, is difficult to obtain. The highland or Haywood's race (*T. s. delamerei*) is the most widespread, ranging from Lake Rudolf south to the southern border and east from the Rift Valley to the edge of the nyika. The males are dark brown, the females russet-tawny, with few or no markings. The Swahili race (*T. s. olivaceus*), males olive-grey with white spots, females cinnamon, with 6 to 8 white cross bars, replaces it on the coast plain from

the southern border to Lamu at least. The Uganda race (*T. s. dama*) found on the Uasin Gishu and in north Kavirondo, is paler than *delamerei*, the males spotted with white, females with 4 to 6 transverse bars. The Masai race (*T. s. masaiicus*) in the extreme south of Nyanza and Masai-land, has a light coat with white spots, and transverse stripes in both sexes. Natives think the meat of all bushbuck poisonous.

Ten *delamerei* and ten other bushbuck may be shot under a Sportsman's or Resident's licence, and one of any kind under a Traveller's licence.

Situtunga.—Shoulder height, 36–45 in. Horns, 20–35 in. This handsome swamp antelope (*Tragelaphus* or *Limnotragus spekei*) is seldom seen, but occurs in papyrus swamps round Lake Victoria, Elgon, and the headwaters of the Nzoia river. Here it lives in the mud and water, immersing itself completely when disturbed, and can seldom be shot unless the morass is thoroughly beaten.

Two may be shot under a Sportsman's or Resident's licence.

Great Kudu or *Marua*.—Shoulder height, 60 in. Horns (males only), 45–60 in. on curve. This superb antelope (*Strepsiceros capensis*), though nearly exterminated by rinderpest, and still scarce, is found locally on rocky hills among thorn bush and euphorbia, mainly in the northern districts. It is very wary and hard to stalk, and probably exists in greater numbers than is generally supposed. Its habitats, which are widely separated, include the hills north of Lake Natron, east of Baringo, west of Makindu, and south of Rudolf, the Loita plains, and the Taita hills. Meat excellent.

One male may be shot under a Sportsman's or Resident's licence, except in the Baringo district.

Lesser Kudu or *Marua Mdogo*.—Shoulder height, 41 in. Horns, 30 in. on curve. This species (*Strepsiceros imberbis*) is found chiefly on the northern Guaso Nyiro and in the Turkhana country, where its condition is satisfactory. It also occurs locally in the stony and bushy country of the Southern Reserve and Seyidie Province, the Taru desert and arid plain between the railway and the Tana, and the nyika of Jubaland and Tanaland, often far from water. It may nearly always be found where sansevieria is abundant. Lesser kudu go in small parties, the males often solitary. They feed at dawn and dusk, chiefly on acacia and sansevieria, and are shy and very difficult to shoot.

Four may be shot under a Sportsman's or Resident's licence.

Giraffe or *Twiga*.—Height (bulls), 16–18 ft. The giraffe is widely distributed through the nyika and open grass lands. Three distinct races are represented. (a) The Uganda race (*Giraffa camelopardalis rothschildi*), distinguished by its massive skull and great size, ranges the Turkhana and Uasin Gishu districts. (b) The Somali race (*G. c. reticulata*) with handsomely reticulated chestnut red coat, replaces it in Jubaland, north and east of the Tana. (c) The Masai race (*G. c. tippelskirchi*) distinguished by the stellate shape of the blotches, ranges the nyika south of the equator, from the coast

inland to the edge of the savannah, and the southern border to the Tana, and ascends in the Rift Valley to 7,000 ft.

The giraffe is absolutely protected. It may only be hunted under special licence, price Rs. 150. This authorizes the killing or capture of one bull, but not in Fort Hall or Machakos districts.

Bush-pig or *Ngruwe*.—Shoulder height about 26 in. The East African bush-pig (*Potamochoerus chæropotamus daemonis*) ranges from Kenya and the Tana river south and west, to the southern border and Uganda. The Abyssinian race (*P. c. hassama*), with smaller body and longer tail and ears, replaces it in Jubaland. Bush-pigs are nocturnal, and live in burrows hidden in dense cover. They often do great damage by their night forays on crops; and are further suspected on good authority of being the carriers of swine fever. They are not protected, and must be regarded as vermin.

Forest Hog.—The East African forest hog (*Hylochoerus minertzhageni*) occurs in the highland forests, chiefly near Nandi, Londiani, and Mau, where it is plentiful; on Elgon, Kenya, and the Aberdares (scarce); and on the Kikuyu escarpment. It is solitary, keeps entirely to dense cover, where it ascends to the upper timber line (10,000 ft.), and is seldom seen. It is distinguished by its huge bulk—weighing up to 600 lb. or more—short legs, dense black coat, large muzzle, and prominent warts beneath the eyes. The tusks are $5\frac{1}{2}$ – $7\frac{1}{2}$ in. long.

Not protected.

Wart-hog or *Njiri*.—Shoulder height, 26–30 in. Upper tusks, 8–20 in. on curve. The East African wart-hog (*Phacochoerus africanus aeliani*) is common in scattered bushland on the highland plateau, between 3,000 and 8,000 ft. In the nyika and northern Guaso Nyiro basin below 3,000 ft., it is replaced by the smaller desert race (*P. a. delamerei*), with reduced or absent incisors and enlarged warts. Both types live in burrows, and near populated districts tend to become nocturnal. Wart-hogs are often hunted on ponies; an exciting and dangerous sport. The meat is excellent. They are not protected.

Hippopotamus or *Kiboko*.—The hippopotamus is found in most of the lakes and rivers, ascending to 8,000 ft., and is specially abundant on the Tana and in the Lorian swamp. In cultivated districts it often does great damage to river-side crops, feeding on corn, vegetables, or any green stuff.

It is protected on Lakes Naivasha, Elmenteita, and Nakuru. Elsewhere two may be shot under a Sportsman's or Resident's licence.

Carnivora

Lion or *Simba*.—Shoulder height, 40 in. Weight, 400–500 lb. The East African lion (*Felis leo masai*) is distributed everywhere, except in dense forest and waterless desert, and ascends to 9,000 ft.; but is most common on open and lightly bushed plains, such as the Athi, Kapiti, and Loita. It abounds on the Tana, northern Guaso Nyiro, Laikipia plateau and in the Rift Valley, though sportsmen and settlers have much reduced it. Lions

are conservative, and cling to one locality. They sometimes, but not often, attack farm stock; but their favourite kill is zebra, and next to it hartebeest. Bush lions, which are generally maneless, feed on bush-pig, eland, the smaller buck, and occasionally buffalo. Lions are sometimes hunted on ponies, April being the best month for this sport; and are also rounded up by mounted beaters. Settlers also deal with them by traps and poison. Owing to the rapid decrease in their numbers they are now partly protected. On private land, or within 20 miles of it (save in a game or native reserve), they may be killed or captured without licence, also within 5 miles of any railway, or of private land in a native reserve. Elsewhere, 4 only may be killed under a Sportsman's or Resident's licence.

Leopard or *Chui*.—Length 5 to 7 ft., maximum, 8 ft. The leopard, though seldom seen in the open, is common in forest and thick bush. The East African race (*Felis pardus suahelica*) is of medium size; and the rosettes, of numerous small spots, are almost identical with the pug mark. It is widely distributed from the coast to the Rift Valley, ascending on Kenya and the Aberdares to 13,000 ft. A large highland race (*F. p. fortis*) with long fur, replaces it on the Mau plateau. The leopard has immense strength, and can carry off a 200 lb. buck. The favourite kills are baboons, monkeys, duikers, and dik-dik. It is extremely fond of dogs, and will take them from compounds and verandahs, even in good-sized townships.

Unprotected.

Cheetah.—Length (male), 7 to 8 ft. The cheetah, though not very common, lives on the open plains, generally lying up in bush or grass-clumps. Two races are found. The large highland type (*Cynaelurus jubatus velox*), with long fur and close-set spots, is general west of 37° east longitude. In the coastal drainage area it is replaced by the paler, short-coated *C. j. raineyi*, ranging from the Rift Valley to the coast. The favourite kills are gazelle, oribi and steinbuck.

The rule for cheetah is the same as for lion. Two only may be killed under a Sportsman's or Resident's licence in the districts where it is protected.

CHAPTER VI

NATIVE POPULATION¹

Ethnology—Social Organization—Dwellings and Clothing—Tribes.

ETHNOLOGY

BRITISH EAST AFRICA is a borderland between two great ethnological zones, and with a comparatively small population it contains an extraordinary diversity of culture and racial types, ranging from the elaborately-dressed semi-Asiatic inhabitants of the ancient coast towns to the primitive cave dwellers of Mount Elgon and the naked negroes of Kavirondo.

The three main ethnical divisions are the Hamite, the Bantu, and the mixed negroid-Hamitic type of which the chief representatives are the Masai and the Nandi ; but in addition to these must be mentioned one pure Nilotic people, the Jaluo of Kavirondo, and the mixed Asiatic-negroid population of the Swahili coast.

Traces of aboriginal Population

The earliest inhabitants of the territory seem to have belonged to a race of pigmy or Bushman character, traces of which exist in the Wandorobbo, who are found throughout the central and southern districts of British East Africa, in the Sandawi of what was once German East Africa, and possibly in the various dependent or pariah tribes of hunters attached to the Somali and the Galla, such as the Midgan and the Watta, the Wasania of the Tana, and the Walangulu of the Taru desert. At present all these tribes more or less share the characteristics of the peoples to whom they are attached,

¹ For statistics of Native, European, and Asiatic populations see Appendix A, p. 581.

a fact which is partly explained by their having incorporated outcasts and the remnants of broken tribes, especially in times of famine, when pastoral or agricultural natives are driven to live with the hunting tribes. Many observers have testified to the existence of a pigmy-like strain not only among the Wandorobbo, but also among the Nandi, Suk, and other tribes west of the Rift valley, and on Mount Elgon and Mount Kenya. There seems to be no trace in British East Africa of a language, such as that of the Sandawi, which is related to this aboriginal stock. The Wandorobbo always speak dialects of Nandi even when they live far east of the Nandi country in Kikuyu.

Hamites

The Hamitic type is well defined. It is slim and wiry in build and markedly dolichocephalous, with high narrow forehead, good features, reddish complexion, plentiful black frizzy hair, and small hands and feet.

The two Hamitic peoples of British East Africa are the Somali and the Galla. At present the former occupy the whole of Jubaland, and are occupying the wells and displacing the Galla tribes in the Northern Frontier District; but they are recent comers, since they first crossed the river Juba between 1842 and 1848. It is, however, probable that there was a much earlier migration of peoples of Somali stock, which would account for the existence of the Rendile or Randili of Marsabit district, a pagan tribe of Somali blood and language which stands quite apart from the other Somali peoples. Moreover, among the tribes of the Northern Frontier District are several, such as the Gurre, the Sakuye, and the Ajuran, which occupy an intermediate position between the Somali and the Galla.

The Galla of British East Africa may be roughly divided into two sections: (1) The various Borana tribes of the Northern Frontier District, many of which are recent immigrants from Abyssinia; (2) The Wardeh or Wurde who penetrated southwards to the river Tana about a century

ago. The latter were, after the Masai, the most formidable raiders in East Africa, and they penetrated far into the interior. When the Akamba first moved northwards into Kitui district, they found nomad Galla from the Tana in possession and had to wage a long war with them. The Akikuyu also have a tradition that there were formerly Galla settlements in their country. In character the Galla and the Somali now show little resemblance to one another. The Somali are warlike and aggressive, proud and independent, with a marked taste for trade and travel. The Borana, on the other hand, are said to be 'a pleasant people to deal with, friendly and docile, but very lazy and dirty', and not very intelligent. They are quite incapable of holding their ground against the constant pressure of the Somali. The Galla of the Tana have been considerably affected by intermixture and intercourse with the Wasania and the negro Wapokomo; they are moreover, like their relatives the Borana, being subjected to the pressure of the Somali migration.

Negroes

(i) *Bantu*.—The Bantu form the bulk of the native population of British East Africa. Their true habitat is the coast territory both of the Indian Ocean and of Lake Victoria, and their great expansion in the eastern part of the central highlands is of comparatively recent date. The Bantu of the lake coast belong to a different migration and speak an older type of language than that of the coast peoples. The latter include the Wapokomo of the Tana and the Wanyika tribes farther south, but their most important sections at present are those which inhabit the country from the river Athi to Mount Kenya and the Aberdare range, the Akamba, the Atheraka, and the Akikuyu. The Bantu of Lake Victoria include a number of separate tribes, the Wawanga, the Abakabarasi, the Abakisii, &c., but they are generally described collectively as the Bantu Kavirondo.

The Bantu population of British East Africa has been considerably affected by non-Bantu influences, both physical

and social. The Akamba have perhaps best preserved the true Bantu type, the Akikuyu having been influenced by the Masai and Wandorobbo, the Wapokomo by the Galla and Swahili, and the lake peoples by their Nilotic neighbours. The Kavirondo are perhaps the most enterprising of the British East Africa natives, and will travel a good distance in connexion with employment. It may generally be said that the Bantu show greater power of accommodating themselves successfully to modern economic circumstances than do other races such as the Hamitic, which, on account of still remaining at a somewhat archaic stage of quasi-military social organization, do not tell with the full force of their perhaps better brains and finer physique.

(ii) *Nilotic*.—The Nilotic type is clearly differentiated from the Bantu, which may be regarded, at least in this part of Africa, as the typical negro. The Nilotes tend to be very tall, with a disproportionate length of leg and poor muscular development. The features are broad and flat, except in cases where there is a slight infusion of Hamitic blood. The Nilotic language group is also sharply contrasted with Bantu. It has a monosyllabic basis, and shows a strong preference for consonantal endings, while the Bantu class prefix and concord are entirely absent. Though the Nilotic race is the main element in the important Hamitic negroid group of peoples, it has only one pure representative among the peoples of the territory. These are the Jalu of Kavirondo, who are closely connected both in physical type and language with the Acholi and Lango of Uganda. They are isolated from their kindred tribes by the Bantu Kavirondo, and they form the most southerly section of the Nilotic race.

Hamitic Negroids

British East Africa is the chief habitat of this very interesting group of peoples, which both in language and in physical type differs widely from the true negro type. The group falls into two broad sub-divisions :

- (1) The hill tribes of Mount Elgon and the highlands west

of the Rift valley—the Nandi, Kamasia, Hill Suk, Elgonyi, Sotik, &c. These all speak forms of the Nandi language.

(2) The pastoral tribes of the plains, the Masai, the Samburu, and the Turkana. Their languages belong to a different group from Nandi, and are related to those of the Karamojo, Latuka, and Bari in Uganda and the south-east Sudan. In the case of the Karamojo, at any rate, this is apparently due to the Turkana having imposed their language and some of their customs on a Bantu tribe.

The place of origin of this mixed race is usually held to have been situated between the Bahr el-Jebel and the Abyssinian highlands, whence different migrations pushed south-east by the southern end of Lake Rudolf to the highlands of British East Africa—the main evidence for this view being the existence of the Bari language on the Upper Nile. On the other hand there is some reason for thinking that this race may have originated in the region east and south-east of Lake Rudolf. It is here that the pagan Hamite comes into closest contact with the negroid peoples, and it is here that the purest type of the mixed race is found to-day, while the farther one travels north-west towards the Upper Nile the more purely negroid does the physical type become. Moreover, there is indubitable evidence that the process of admixture has been going on in quite recent times south-east of Lake Rudolf, between the Turkana, the Samburu, and the Rendile, who are true Hamites. On this hypothesis the Bari and Latuka languages would have to be explained by a movement of tribes of Turkana type from the southern end of Lake Rudolf to the north-west, instead of vice versa.

It is in any case quite clear that the Masai and the Samburu possess a far greater admixture of Hamitic blood, and show more trace of Hamitic influence than any other of these peoples, whether of the Turkana or the Nandi groups. While the typical Turkana or Nandi is unmistakably negroid, the Samburu and Masai resembles the Hamite in his slim, well-proportioned body, small hands and feet, and well-marked features. The comparatively narrow bridge to the nose

especially marks off the Masai from the flat-nosed Turkana. As regards skin colour, the dark red of the Masai again places him between the negro and the Hamite.

In physical type, however, the whole of this mixed race is extraordinarily lacking in uniformity, and many of its divisions include every variety of type from the pure negro to the semi-Hamite. This diversity is greatest among some of the tribes of the Nandi group, which has been held by some authorities to include not only Hamitic and Nilotic elements, but also a Bantu and an aboriginal-pigmy strain. Thus the author of a monograph on the Suk describes the physical type of that tribe as ranging 'from the dwarf-like pigmy with spread nose and bolting eyes, to the tall handsome Hamite, with almost perfect features'. Even among the far less mixed Turkana people we find two markedly different types: (1) the true Turkana, about 6 foot high and heavily built, with large hands and feet, brachycephalic and prognathous, with large flat features, and (2) a Samburu or Rendile type—dolichocephalic and orthognathous, slender, and of medium height, with small hands and feet. There is no doubt that Hamitic types of this kind which are found among the Suk, Turkana, &c., are the result of a comparatively recent influx of Samburu and Masai refugees, due to the defeat and breaking up first of the Samburu who occupied the Baringo district, and afterwards of their conquerors the Laikipia Masai, both of which events took place in the latter part of the nineteenth century.

The languages spoken by these peoples apparently represent a modification of the Nilotic language group under Hamitic influence. They differ from the pure Nilotic tongues—Dinka, Acholi, &c.—by the length of their words and by the rarity of monosyllables. Direct borrowings from Somali and Galla are few, and are chiefly noticeable in the case of the numerals.

We have already mentioned that this family includes two groups, Nandi and Masai-Turkana; these seem to be parallel developments, but not otherwise interconnected. Masai loan words are, however, common in the Nandi dialects, as

they are to a less extent in the tongue of the Bantu Akikuyu. These languages are generally characterized by the importance of the article and the relative. The article is affixed in the case of Nandi and Bari, prefixed in Masai and Turkana. Suk, which is a primitive form of Nandi, is, however, peculiar in that it possesses no article. Adjectives are usually expressed by the use of a relative and a verb. Nouns are inflected to distinguish singular and plural only, gender and case being indicated either by prefixes or by the inflection of the article. The verb is, however, very well developed, and indicates not only person and time, but also direction and the object of an action, thus compensating for the lack of cases. Both in Masai and Nandi, verbs are divided into two classes of conjugation, the one including all those which begin with *i*, and the other those beginning with any other letter. Turkana resembles Masai fairly closely, but is peculiar in its negative and in its articles.

Swahili

In the early middle ages the East African coast was settled by Mohammedan colonists from Southern Arabia and Persia. In course of time a mixed race and language grew up from the intercourse between these Asiatic settlers and their negro neighbours and slaves. In the middle ages Malindi, Lamu, and Mombasa were perhaps the most important of all the Swahili towns in East Africa, but from the eighteenth century onwards they became subordinate to the Arab Sultans of Oman and Zanzibar, and their government was mainly in the hands of immigrant families from Oman.

The Swahili language, which is Bantu in structure, but possesses a large Arabic vocabulary, has become the *lingua franca* of the whole of East and East Central Africa.

At the present time the name Swahili is applied to any negro who has come under the influence of the civilization of the coast, i. e. who professes Mohammedanism and speaks the Swahili tongue, and it no longer implies any oriental blood. A population of mixed oriental blood representing the true

Swahili still inhabits the coast and islands from the southern frontier to the islands of the Lamu group, where it is most strongly represented. North of Lamu this population is, however, diminishing, the birth-rate being very low. The coast islands are inhabited in small numbers by a similar type of people, known as Bajuns, who claim to represent the original Persian settlers.

SOCIAL ORGANIZATION

None of the peoples of British East Africa possess a highly developed form of social organization. Nowhere has a strong state formed itself at all comparable to the native kingdoms of the Uganda Protectorate. The Bantu tribes of the interior—the Akamba, the Akikuyu, &c.—are politically among the most backward of the African peoples; the Hamites, in spite of their intelligence and vigour, are but warlike nomads.

Among the Somali there is, as a rule, no trace of inter-tribal co-operation. Each clan or section lives its own life, and spends its time in constant warfare and raids upon its neighbours. The authority of chiefs is small and rests rather on a man's prowess as a leader, or on his popularity with the young fighting men, than on hereditary authority or official position. Islam, however, acts to some extent as a unifying force, and it is conceivable that a religious reformer of the type of the Mad Mullah might combine even the classes of the Jubaland Somali for a common purpose.

The Masai, though they never developed anything which could be called a state, showed in the past considerably more power of co-operation than any other peoples of British East Africa, and in consequence their institutions have had an enormous influence on all the other peoples of the central highlands.

The most characteristic feature of Masai society is the Spartan organization of the warrior class on which the whole life of the tribe centres.

The life of the Masai consists of three stages—that of the *laiok* or uncircumcised boy, that of the *moran* or warrior, and

that of the *moruah* or married elder. The circumcision ceremony takes place in four successive years during a period of seven and a half years, and all the youths circumcised in this period form one class (*poror*), and are known by a collective name such as 'The Pursuers', or 'Those who Increase'. These classes are grouped together in pairs to form generations, and it is to this larger group that the defence of the tribe is entrusted. Every seven and a half years there takes place a ceremony at which the eldest warrior class assumes the garb of the elders and hands over the care of the country to the class that has been recently circumcised.

Within the *poror* the social unit is the *sirata* or company of warriors under a captain (*lutuno*). The company of warriors lives in common in a separate *manyatta* (kraal). They may neither work nor marry, though they are allowed to cohabit with the immature girls (*endito*).

It is only among the Masai and the tribes which have directly imitated them, notably the Nandi, that the warrior class becomes the centre of the whole tribal organization and overshadows family and class divisions. The class system itself is, however, far from being peculiar to the Masai, and is found among all the Hamitic and Hamitic-negroid peoples and many of the Bantu tribes of British East Africa. The latter, however, seem to have derived it in every case from their semi-Hamitic neighbours, as the Wapokomo from the Galla, and the Akikuyu from the Masai. Among the Somali the institution is falling into disuse, but the class still possesses its distinctive name, which is usually of a derogatory nature. Among the Galla the class is named *luva*, among the Nandi *ipinda*, among the Suk *pen*, among the Turkana *asavanissa*, and among the Akikuyu *rika*. As a rule the class covers either seven and a half years (Masai and Nandi) or fifteen years (Suk and Wapokomo). Among the Akikuyu, however, it covers only two years, and four or five years with the Turkana. Among the Nandi, the Suk, and some other tribes, the class names consist of a fixed cycle of seven.

In addition to the sub-district, which is the territory of the

sirata, the Masai people is divided into districts, each of which is under the authority of a chief, *aunoni*, elected by the warriors, at the *unoto* ceremony, and by an adviser, *aigwenani*. These are in turn subject to the *laibon*, who is the supreme authority of the whole tribe, and is at once medicine man, prophet, and chief. The office is a strictly hereditary one, and has existed for nine generations. The greatest of these *laibons* was Mbatian, who died in 1890, and who has been practically deified by the Masai, and by other tribes such as the Nandi.

Many other tribes throughout the highlands, such as the Samburu, Nandi, and Lumbwa (Kipsikis), possess hereditary *laibons*, who trace their descent from some Masai family.

The whole Nandi organization is a close imitation of the Masai system. Their country is divided into districts and sub-districts, *pororiet* and *siritiet*. The latter contains from twenty to twenty-five warriors, under a captain, *olaitoriot*, who is responsible to the chief of the district, the adviser, *kiruogindet*. The adviser is in turn responsible to the *orkoiyot*, or *laibon* of the whole tribe, who also has a representative of his own, the *maiortiot* in each district.

The inland Bantu peoples, as we have said, possess no tribal organization. All their social life centres in the family. Among the Akikuyu, the Akamba, &c., the social unit is the homestead, which usually consists of the huts of a man and his wives. Often, however, brothers and uncles settle in the same homestead, which thus contains any number of huts from 3 to 30, all surrounded by a thorn hedge. These homesteads, though each is independent under its own elder, are not usually isolated, but are grouped together for mutual aid and protection. The group of homesteads is known as *thome*, from the open space which is used as a common meeting-place, and the council of elders which meets there was really the only authority that these peoples naturally acknowledged. In some cases, however, a loose confederation may be formed between several *thome* which possess a common holy place for sacrifice, or which resort to a common medicine man. The

co-operation of a whole district in war is purely temporary, and special war leaders are chosen for the occasion. Among the Akamba, however, such common action is rare, and the different thomes used often to stand apart from one another, even when the country was raided by the Masai. The initiation ceremonies which are performed in common by a whole district among the Akikuyu supply a certain bond of union between the members of the same class, though the latter has none of the rigid organization of the Masai *poror*.

When the country was occupied by the British, the Government attempted to solve the problem of authority by setting up local chiefs. It was, however, found to be extremely difficult to induce the people to recognize these new authorities. In some cases, it is true, the chiefs exercise real authority and prove invaluable to the government. Kutu, the chief of Kikuyu, for example, wields authority so great that he is indispensable to the administration, and, in spite of being personally objectionable and very unpopular with the missionaries, he was recently reinstated after a period of removal. If there were more such powerful chiefs the task of administering the natives would be much easier.

Partly as a result of the failure of the system of administrative chiefs, but without superseding these, the councils of elders were recognized after 15 years by the Government, and each was made responsible for a definite district, but the elders possess less influence than is desirable. The people see that they are open to bribery, and the more sophisticated natives despise some of their methods, such as recourse to ordeal (as by licking a red-hot knife), while owing to the cessation of tribal warfare the young warrior class tends to degenerate into a disorderly rabble.

An objectionable feature connected with the institution of administrative chiefs is that these, in order to assert and maintain their authority, have found it necessary to form bands of armed retainers to whom they accord special privileges, which are found to be oppressive, such as giving them part of the confiscated goods of recalcitrants. It is said by

some that in connexion with these retainers the native custom of *ngwiko*, found, for example, among the Ndia, Embu, Chuka, and Theraka, &c., has received a most unfortunate extension and sanction. This means that the girls who have attained the age of puberty are compelled to spend the night in certain special kraals where they are visited by the retainers, it being understood that any girl rendered pregnant will be married by the child's father. It is also possible that these administrative chiefs act in an oppressive fashion in connexion with the recruiting of labour.

The social organization of the more primitive of the Nandi-speaking hill tribes is as backward as that of the inland Bantu peoples. Among the Suk, for instance, there are no chiefs or laibons, and each elder rules his own homestead. An elder of exceptional wealth or wisdom tends to be regarded as an authority by his neighbours, and is called *kimwokin*, or Adviser.

Among the Bantu peoples of the coast, such as the Wapokomo and the Wa-Giriana, tribal organization is somewhat more developed. Each sub-tribe is ruled by a council of four elders (*kambf*), the senior of whom is called *haju*, and is recognized by the Government as a headman.

The Kavirondo peoples are far the most advanced socially of all the negroid peoples of the Protectorate. Both Nilotes and Bantu are ruled by hereditary chiefs. Those of the Awawanga developed a considerable power, not unlike that of the Bantu 'kingdoms' farther west, and a number of lesser tribes acknowledged their authority at the time when the country was taken over by the British.

Excepting on the borders of the Nandi country, the Kavirondo peoples live in large villages, which were formerly surrounded by a moat and clay walls. The security of the present régime has, however, led to the abandonment of these defences, or to the substitution of a thorn hedge.

The clan exists as a primary unit among all the peoples of British East Africa. It tends to be most important among the most primitive peoples, such as the Bantu Athezaka, and

the Nandi-speaking Kamasia and Endo with whom it coincides with the local division of the tribe. Where it has lost this unity it tends to fall into the background and to be replaced by the new local subdivision of the tribe or by the class.

Thus, among the Masai the clan (*gilat*) and its subdivisions are only important in regard to marriage, and to the joint claim and responsibility for blood money. In some tribes even the rule of marriage outside the clan or sub-clan is tending to be forgotten. It seems, however, to have been a universal rule at one time, save among the Galla of Tanaland, with whom all the clans are grouped together in two exogamous divisions, named Iridida and Barietuma.

Among the negro and Nandi-speaking peoples, though not among the Masai and Samburu, the clans are generally totemistic, and in many cases there are tabus connected with the totem animal or plant. Thus among the Meru, the totem is called *netiri*, the forbidden thing, and a man is not allowed to eat it (in the case of edible objects) until he has been initiated. Among the Nandi these tabus are highly developed. For example, the Duiker clan may not eat the flesh of the duiker or the rhinoceros, they may not plant millet, and they may not have any intercourse with the caste of smiths.

The Family

Polygamy is practically universal among the peoples of British East Africa, with the exception of some of the poorer hill tribes, such as the Endo and Maragwet, who are generally monogamous. Two or three wives are usual among the Bantu peoples, and a chief may have 20 or 30. Mumia, the chief of the Awawanga in Kavirondo, was said in 1902 to possess 80, and Karori, a chief in the Fort Hall district, as many as 100.

Among the agricultural peoples the economic grounds of polygamy are very strong, since each wife cultivates her own shamba, and if a man owns much land it is necessary for him to have many wives. The shamba, which is usually 1 to 3 acres in size, is attached permanently to the woman who cultivates

it, and is eventually divided among the first wives of her sons after the death of their father.

The first wife is always the head wife, and her eldest son is looked on as the first born, even if another wife should have given birth to a son before her.

Mode of Subsistence

The peoples of British East Africa may be divided into two classes—pastoral nomads and sedentary agriculturists. To the former class belong the Somali and the Galla, the Masai, Samburu, and Turkana; to the latter the Bantu peoples, the Nilotic Kavirondo, and most of the Nandi-speaking hill tribes. A third class of little economic or social importance is formed by the hunting tribes such as the Wandorobbo and Wasania.

The economic life of the whole territory has been deeply affected by the British occupation. Under the new condition of things there is no room for the warlike pastoral nomads who were formerly the ruling peoples of the highlands, and the most important of them all, the Masai, have been segregated in a reserve in order to make room for the white settler. On the other hand the sedentary agricultural population has been secured against the raids of their neighbours, and it has become possible for them to acquire a certain amount of stock. In consequence practically all the peoples of British East Africa, whether Bantu, Nilotic, or Nandi, now own cattle.

The pastoral peoples of the arid northern districts have not, of course, been directly affected by British colonization. The pacification of the country has, however, opened up a considerable cattle trade between Abyssinia and the central highlands, a trade which is mainly in the hands of the Somali. Even the far less intelligent and enterprising Borana have shown themselves to be keen traders, and they also bring *safuris* of live stock down to Meru and Nairobi, taking in exchange a large assortment of trade goods. The stock of the Somali and Galla consists chiefly of cattle, camels, donkeys, and

sheep. The Ogadein are the chief cattle-raising tribe, while the Marehan own horses and camels.

Alike by the Masai, the Nandi and the negro peoples, cattle are held in extraordinary estimation. They are valued not only as the chief form of wealth, with which wives may be purchased and fines paid, but for their own sake, since the pastoral tribes believe that the welfare of the cattle brings with it infallibly the welfare of the tribe. The care of the cattle always devolves upon the men, and in some tribes, such as the Nandi and Akikuyu, it is the duty of the warriors to sleep in the cattle kraals.

The cattle are not kept for meat, though meat is frequently eaten by the Masai warriors.

Milk is a staple article of diet with all the pastoral tribes, and they have all acquired the custom, probably Hamitic in origin, of drawing blood from the living ox, and drinking it raw or mixed with milk.

Both the Masai and the Akikuyu whom they have influenced have a strong objection to eating game, and consider it to be the mark of an outcast. On the other hand the Akamba, the Nandi, and most of the Nandi-speaking hill tribes eat it readily, and are bold and skilful hunters like the Wandorobbo. The Wapokomo, unlike other tribes, hunt the crocodile, and eat crocodile meat.

Fishing is one of the main resources of the Nilotic Kavirondo, and is also practised by the Bantu Kavirondo and by the Wapokomo. The Nilotic Kavirondo dry large quantities of fish, and barter it for grain, &c., with the neighbouring inland tribes.

Agriculture is the main mode of subsistence among all the negroid and Nandi-speaking tribes. The actual work of cultivation is performed as a rule by women, but the clearing of the land is the work of the men. Maize, millet, and bananas are the chief native crops, and rice is cultivated on the coast and by the Wapokomo of the Tana valley. Cultivation is everywhere performed with the short-handled native iron hoe and the wooden digging stick.

Irrigation is practised by the people of Njemps and by the hill tribes of the Baringo district. The construction of the ditches is the common business of the whole tribe, and is often performed with considerable skill. Thus, all save 2 miles of the Endo country, which is 10 to 12 miles in length, is watered through channels taken from a single river.

With regard to industry and building the pastoral tribes are decidedly inferior to the negro agriculturists. Among the Somali and the Masai iron working is confined to separate tribes, which are looked down upon as inferior, and are not allowed to intermarry with the rest of the people. These are the Tumulods among the Somali, and Il Kunono among the Masai. Their position is very similar to that of the sections of hunting Wandorobbo or Wasania attached to Masai or Galla tribes.

DWELLINGS AND CLOTHING

The ordinary form of dwelling throughout British East Africa is the round hut with conical thatched roof. There are the remains of stone kraals on the Uasin Gishu plateau, and these seem to have been the work of the Masai. The ordinary Masai dwellings are of a peculiar type, which in plan resemble the *tembe* villages farther south. They consist of low, flat-roofed huts, made of poles and brush wood, plastered with clay, which run in a continuous line round the interior of the rectangular inclosure of the settlement, and are divided from one another by strong interior partitions.

Most of the peoples of British East Africa live not in villages, but in isolated kraals, the main exceptions being the Kavirondo peoples, who live in large walled or palisaded villages, and some of the northern hill tribes of the Nandi group, such as the Endo and the Maragwet. These build their huts on levelled platforms rising one above the other, high up on the hillside, and their villages give an impression of neatness and order. It is remarkable that their neighbours, the closely-allied Suk, are the worst-housed people in the whole territory and live

in huts that are no more than rough temporary shelters against the weather.

The Nilotic peoples are everywhere characterized by their tendency to complete nudity, and this is nowhere more remarkable than among the Jalu of Kavirondo. The Bantu Kavirondo resemble their Nilotic neighbours in this respect, though the old men usually wear a skin, slung from the shoulders. Both these peoples are devoted to ornament.

The Turkana, who are the most Nilotic, probably, of all the Hamitic-negroid peoples, also go naked. They adopt a most elaborate fashion of dressing their hair, which is plaited into a kind of chignon with wool and caked with clay until it forms an oval shield covering the whole spine. This fashion is also adopted by the Suk. The other Hamitic negroid peoples wear a considerable amount of clothing, but they are all, like the Nilotes, indifferent to nudity in the case of men, and wear their clothes without regard to decency. Warriors, as a rule, wear a skin cloak, slung from the shoulders, while old men wear a fur karos. Women, unlike the Kavirondo, always wear an apron, and after circumcision an upper garment as well. The women of these tribes, especially the Masai, wear large quantities of brass wire round the arms and legs. The heads of the women are shaved, whilst the warriors grow their hair long. Among the Bantu peoples, the Akikuyu have imitated the Masai to a great extent and like the latter wear brass wire and ear ornaments. Among the Akaṁba, however, we find the usual Bantu apron or kilt worn by both sexes. The Meru women wear beautifully worked goat skins ornamented with beads and shells.

On the coast the full cotton dress of the Mohammedan Swahili is the rule, and it is spreading to all the native tribes, such as the Wapokomo, which come within the range of coast civilization.

The Somali in the north, as well as the Borana, wear an ample toga-like toke, which covers the whole body. Their women, though fully clothed, are not veiled.

TRIBES

HAMITIC

Somali

The Somali in British East Africa all belong to the Darod Ismail branch, with the exception of a few Isaak from Aden who are settled at Nairobi. The three main branches of the British East Africa Somali are : A. Marehan. B. Ogadein. C. Herti.

A. *Marehan*. The Marehan occupy North-East Jubaland between Dolo and Serenli. They have migrated from Italian territory during the last 20 years. A few years ago their numbers probably did not exceed 5,000, but of late they have been largely reinforced by numbers of the Galti Marehan. They possess large numbers of camels and horses but unlike the Ogadein they do not rear cattle to any extent.

1. *Rer Hassan*. Chiefs, Ahmed Aden Roble and Gere Ali Gabawein.

The Rer Hassan were the original settlers and have been much raided by newcomers. In 1912 Col. Thesiger estimated they could put 2,000 men in the field.

2. *Rer Isaak*. Subsections :

- (a) Rer Farah Ugas : number about 750 fighting men. Chief, Farah Got, an elderly man of strong character and intelligence. His principal assistants are Gahad Fillul, a good type of fighting man, and Deria Chakool.
- (b) Rer Ahmed Weid : 400 fighting men, all with rifles. Their chief, Shirreh Jama, was originally one of the 'Mad Mullahs' men, and aimed at a similar position. He was, however, recently killed.

This section is most averse from Government control.

- (c) Rer Eili Dera : between 300 and 400 fighting men. Chief, Mohammed Garabi.

These 3 sections (a), (b), and (c) form the Galti or strangers.

- (d) Rer Tulha : unimportant. Chief, Hassan Daba.

- (e) Rer Ali.

- (f) Rer Gerard.

- (g) Rer Wegieda : form the Bon Marehan.

3. *Bon Marehan*. Headmen Sheikh Ibrahim and Ibrahim Burreh. They have about 1,000 fighting men, but of poorer quality, than those of the Somali proper. They are rich in stock and cultivate shambas.

Subsections :

- (a) Habr Auarasama.

- (b) Habr Yakob.

- B. *Ogadein*. The Ogadein are divided into seven divisions :
 1. Mohammed Zubeir. 2. Aulihan. 3. Abd Wak.
 4. Abdullah. 5. Maghabul. 6. Rer Mohammed. 7. Habr Suliman. Of these the last two divisions are unimportant.

Divisions 1, 2, and 7 form the Bahulla Ogadein.

Divisions 3, 4, and 6 form the Talamuga Ogadein.

1. *The Mohammed Zubeir* are the numerous and influential section of the Jubaland Ogadein. They occupy the Afmadu district as far south as Deshek Wama, and they own enormous quantities of cattle. They are divided into the Rer Abdullah and the Rer Isaak. The former of these possesses numerous subsections of which the following are the most important :

- (a) Rer Hersi : chiefs, Osman Gelli Maghan, sultan of the Ogadein, and Abdi Salaam.

- (b) Samanter Kalif : chiefs, Ali Doreh and Ali Jibril.

- (c) Rer Amadin : chief, Ahmed Nur.

- (d) Rer Ugas Ouled : chief, Ali Burreh.

- (e) Rer Amir : chief, Bashir Osman.

- (f) Rer Aden Kheir : chief, Haji Mohammed.
- (g) Rer Ali Nasr.
- (h) Rer Ali Wanag.
- (i) Rer Shera.
- (j) Rer Higgis.

2. *The Aulihan.* These frequent the country west and south of Serenli, and have also penetrated as far inland as Wajheir. They are rich in cattle and camels, the river Juba being their main water supply.

Their two main divisions are the Rer Mumin Hassan and the Tur Adi. These have the following sub-divisions :

(i) Rer Mumin Hassan.

- (a) Rer Wafattu : chief, Abdurrahman Mursal, the leader in the attack on Serenli Port, in 1915.
- (b) Rer Afgab.
- (c) Aden Kheir.

(ii) Tur Adi.

- (a) Rer Songat : chief, Hassan Weji, who is chief of the Tur Adi.
- (b) Rer Hawash : chief, Haji Farah.
- (c) Rer Abukr, which has the following sub-divisions :
 - 1. Rer Ali : chiefs, Ibrahim Shuba and Abdulahi Mahad.
 - 1 a. Rer Ahmed Gedi of Rer Ali : chief, Abdi Nur.
 - 2. Rer Afwa : chief, Ghalinti Ali.

3 and 4. *The Abd Wak and the Abdullah.* These occupy the country near the Lorian swamp, and the Tana river as far south as Kina Kombe. The Abd Wak are the most numerous, and might be able to put 3,000 spearmen and riflemen into the field. These two tribes have a constant feud with the Mohammed Zubeir.

5. *The Maghubul* occupy the Joreh district east of Ramadi. Though not strong in numbers, they are rich in cattle.

C. *Herti*. Divisions :

1. Mijjertein.
2. Warsangeleh.
3. Dolbahanta.

The *Herti* in British territory are mainly Mijjertein. There are a few Warsangaleh, but the Dolbahanta are still east of the river Juba in Italian territory.

Those in British East Africa are about 3,000 in number. They occupy the coast round Kismayu, extending inland as far as the Desheh Wama. They are cattle owners and traders.

Galla

The *Galla* in British East Africa consist of the Warde on the river Tana, and the Boran and Gabbra in the northern frontier districts.

A. *Boran*. These have two main sections :

1. Sabbu : chief, Geydu, the son of Afulata, in Abyssinia.
2. Gorna : chief, Ana Burru of Arero in Abyssinia.

The *Boran* are to be found in most parts of the Northern Frontier District, but the vast majority of the tribe are Abyssinian subjects and live in Abyssinia. The number of these in British territory probably does not exceed 5,000. Formerly they were a very powerful tribe, and held their own against Masai, Turkana, and Somali, but of late years Somali pressure has driven them out of Wajheir, so that they have spread south, and there are now a fair number of villages south of the Guaso Nyiro.

B. *Gabbra*. Their main divisions are :

1. Algan.
2. Golbo.
3. Garra.

The *Gabbra* are *Galla* in stock and speak *Boran*. They

are mainly Abyssinian subjects who are migrating into British territory. They live for the most part near the Abyssinian frontier from Moyale west to the Huri hills. Their tendency is to work south and they are now using Marsabit, and have even appeared on the Guaso Nyiro river near Merti. The numbers in British territory are uncertain probably about 3,000. Their chief headman is Gallarassa, who continues to live in Waiye, in spite of attempts to move him to Marsabit. Two other headmen are Chiromo Ali and Dadu Korecha.

Their stock consists of cattle, camels, sheep, and goats, and a few mules and ponies.

Mixed Hamitic Tribes

There are a number of tribes in the Northern Frontier District and in Jubaland, which probably owe their origin to the inter-mixture of Galla and Somali. The latter have long been an expanding force, and they tend to impress their language and customs on all the weaker Hamitic tribes with which they are brought in contact.

Ajuran. Divisions :

1. Garen. Headman, Ido Roble.
2. Wagalla.
3. Gelbereis.
4. Abdi Mijid.
5. Gashi.

In addition to these sections there are at Wajheir two other sections, the Rer Mohammed and the Gelebleh which call themselves Ajuran but are really Yaben. The tribe is moreover being permeated with indigent Yaben strangers, who become incorporated in it.

The Ajuran are originally derived from the Hawiyeh Somali, but they show a considerable admixture of Boran blood. They are mainly Mohammedan in religion, and appear to talk Boran and Somali indiscriminately.

They come from the Italian side of the river Juba.

They own camels, cattle and sheep, and live in small villages of 2 to 10 huts.

In number they amount to about 6,000 in all.

Garreh. Headmen, Gababa, Ali Abdi, and Aden Shaba.

The Garreh originally inhabited the Italian side of the river Juba, north of Merka, but a large number of them are now in Abyssinia, and they show an increasing tendency to migrate there, under pressure from the east. They are found from the river Daua to Derkali and near Eil Wak. They are Moslems but appear to have more in common with the Boran than the Somali, and speak one language as much as the other.

They are mainly pastoral owning camels, cattle and sheep, but they are quite willing to cultivate. In disposition they are usually peaceable.

Rahanwein or Digil.

The Rahanwein are a tribe of Somali type, but differ considerably from the great Somali tribes which regard them as of different origin. In British East Africa a number of Rahanwein, belonging to two sections, the Laisan and the Rer Dumal, are attached to the Aulihan.

Rendile or Randili. Divisions :

- | | |
|---------------------------|----------------|
| 1. Lorogishu or Nurgushu. | 6. El Durriah. |
| 2. Lugume. | 7. Galdelan. |
| 3. Lougelli or Ungelli. | 8. Nahagan. |
| 4. El Mussola. | 9. Rungumu. |
| 5. Disbahai. | 10. Saleh. |

The Rendile are apparently of Somali stock and their language resembles that of the Rahanwein. They are, however, pagans with hardly a trace of Mohammedan customs. They have intermingled greatly with the Samburu, and the first four of their tribal sections, are also the names of tribal sections among the Samburu.

In their way of life they resemble the Samburu, but

though tame and amenable, they possess much more vigour of character than the latter.

Their wealth consists of camels and sheep, but not cattle. There is no actual headman, but Hurri of the Disbahai is probably their most important man. They inhabit Marsabit district.

Sakuye. These are practically Boran, but their origin is very obscure. They are said to be of Somali origin but they show practically no trace of it. The Boran name for Marsabit is Saku, but whether this is derived from Sakuye, or vice versa, is not known.

They are quite a small tribe, numbering 2,000–3,000. They are found all the way from Moyale to Merti, but show a tendency to congregate more and more on the Guaso Nyiro.

Wasania. These are one of the aboriginal hunting tribes of East Africa, but they have been deeply affected by the Galla, to whom they were in a state of serfdom. They have thus acquired the language and many of the customs of the Galla. They are found scattered throughout the bush country of the coast hinterland from north of the river Sabaki to west of Port Durnford. North of the river Tana they are now subject to the Somali, but some still retain their allegiance to their former Galla masters. They have also intermixed with the Wapokomo. The Wasania are divided into 18 clans, each of which has its chief, and there is also a chief of the whole tribe who belongs to the Gamado clan.

In 1910 their 3 most important chiefs were :

1. Bashora Burrum of the Gamado clan.
2. Mutaida of the Illani clan.
3. Godana of the Gulu clan.

Connected with the Wasania are the Walangulu or Ariangulu of the Taru desert, a small tribe which is now becoming absorbed by the Duruma. They were formerly

dependent on the Galla, whose language they still speak. They are hunters.

Yaben or *Dagodia* or *Dagodia Fai*. Divisions :

- | | |
|---------------------|---------------------|
| 1. <i>Fai</i> . | 3. <i>Massure</i> . |
| 2. <i>Jibrail</i> . | 4. <i>Murulle</i> . |

The *Yaben* are said to have crossed the river *Daua* from *Abyssinia* 10 to 15 years ago, partly to avoid *Abyssinian* oppression, partly in search of new pastures westward. They are also found at *Wajheir*.

Formerly some sections paid allegiance and tribute to the *Garreh* headmen, but as their position improved, they paid less attention to the latter, while also avoiding all dealings with the Government, consequently but little is known of them.

They are meaner in face than the true *Somali*, and in character they are said to be mean spirited and inveterate thieves and murderers.

See also under *Ajuran*.

In addition to the above tribes, there are found near *Lugh* and *Dolo*, the *Rer Shimogr*, the *Gusr Gudr*, and the *Gabawein*. They are harmless cultivators and own many cattle and sheep.

HAMITIC-NEGROID

Masai Group

Masai. The *Masai* were formerly divided into five main geographical divisions, each of which had numerous sub-sections :

1. The *Kaputiei* of the *Athi* and *Kapiti* plains.
2. *En Aiposha* of the *Rift* valley.
3. The *Kisongo* of the *Masai* steppe in *Tanganyika* Territory.
4. 'L *Uasin Gishu* of the plateau of that name.
5. 'L *Aikipiak* of the plateau of that name.

In addition to these divisions there is also a system of clan divisions, the main sections of which are

1. 'L Aiser.
2. Il Mengana or L'Aitayok.
3. Il Mokesen.
4. Il Molelyan.
5. Il Taarosero.
6. Il Lugumai.

At the height of their power, circ. 1830-50, the Masai ranged over all the open grass lands of East Africa between Lake Rudolf and lat. 7° south, and fought with the Galla in the north and the Wahehe in the south. Their power was reduced by a period of internecine war during which the Uasin Gishu division was exterminated. Their downfall, however, came after 1890, in consequence of the loss of their herds by rinderpest. Large numbers perished of famine, others joined the Wandorobbo, Akikuyu, &c., while the southern division resorted to agriculture, and thus incurred loss of caste.

The remains of the pastoral Masai were segregated by the British Government in two reserves, one in the Laikipia plateau, the other between Nairobi and the southern frontier. They have now all been concentrated in the southern reserve. There are also a few remnants of the Uasin Gishu Masai settled in Kavirondo, chiefly at Marama and Nduis near Mumias. These have become agriculturalists.

A certain number also live among the Nandi and Lumbwa to whom they used to hire themselves as mercenary warriors.

Njemps or En Jamsi. These are the inhabitants of the two large villages named Njemps south of Lake Baringo. They represent the remnants of the Samburu population, which once inhabited all the plains from Lake Baringo to Lake Rudolf, and they also include remnants of the Laikipia Masai. The En Jamusi speak Samburu, and

have the Masai organization. Until recent years they were exclusively agricultural, and were frequently raided by the Laikipia Masai and by the Turkana.

Samburu. Divisions :

- | | |
|----------------|------------------------|
| 1. Lorogishu. | 6. Lemwusi. |
| 2. Busigishu. | 7. Nguessi. |
| 3. Lugume. | 8. El Doiju or Doigio. |
| 4. Lougelli. | 9. Nyabarai. |
| 5. El Mussola. | |

Headmen : Lelaruk and Lomendilli.

The Samburu are undoubtedly of the same stock as the Masai, and speak a practically identical language, but they are never reckoned as part of the Masai people. They, however, include a number of Laikipia Masai refugees, and are also much intermixed with the Rendile (q.v.). They inhabit the southern part of the Northern Frontier District and parts of Meru and Nyeri districts, ranging north to Mount Kulal. They have also left traces at Njemps, and among the eastern Turkana of their former residence in the Sugota and Kerio valleys. They now number about 5,000 in all. Their customs are very similar to those of the Masai but they are a shiftless people, the prey of all their neighbours, especially of the Turkana and the Somali. They live in large villages of 50 to 150 huts, but they are constantly on the move, being a purely pastoral people. Their cattle *manyattas* are found in two main areas—the Mbarta plains, and on the Guaso Nyiro river. They own about 30,000 cattle, 150,000 sheep and goats, and 5,000 donkeys.

Turkana Group

Turkana. The eastern Turkana inhabit the plains south and south-east of Lake Rudolf. Their occupation or reoccupation of these lands is recent, and they have advanced greatly at the expense of the Samburu and the Suk.

They are now the most warlike and aggressive people in the Protectorate, and are far more prolific than any of their neighbours.

Wamia or *Etossio* or *Elgumi*. This tribe is settled on the frontiers of British East Africa on the south-western flank of Mount Elgon. They are said to have migrated from the river Turkwel into the Uganda Protectorate and thence come south to their present habitat. They speak the Turkana language, but are somewhat different in physical type, having good features and slender figures, though very black in colour. They have 25 clans and 6 larger divisions, 3 of which acknowledge the same chief.

The Nandi Group

This group consists of a large number of tribes, many of them very small and unimportant, all of which speak dialects of the Nandi language. They are practically all hill peoples, and seem to have been originally hunters, but are now chiefly agriculturists.

They may be divided into two sub-groups :

(1) The tribes of the western escarpment of the Rift valley—the Nandi themselves with the Lumbwa, Buret, and Sotik to the south, and the Elgeyo Kamasia, Maragwet, Endo, and Suk to the north.

(2) The tribes of Mount Elgon, of which the Konyi, Ngoma, and Lako are the most important on the British East Africa side of the border.

Apart from these groups stand the Wandorobbo or Okiek, who probably represent the aboriginal population of the highlands. They are found scattered through the forests of the Kikuyu country and north of Mount Kenya, as well as west of the Rift valley and on the Turkwel river, where they are sedentary cultivators. As a rule they resemble the Nandi in physical type, and they everywhere speak the Nandi tongue.

Endo and Maragwet. These tribes are closely connected with one another and also with the Elgeyo to the south-

west. They differ from their immediate neighbours to the north—the Suk—in their higher degree of civilization. They live in well built villages, instead of in rough kraals and are skilful agriculturists. They own little stock. These tribes are divided into clans, each of which occupies its own district, whilst among the Suk the local and clan divisions are not coincident.

Kamasia or *Tuken*. This tribe is the most numerous and powerful of all the hill peoples north of Nandi. They inhabit the Kamasia escarpment between Lake Baringo and the Kerio valley. They are divided into numerous clans which form local units. They have had great influence on the surrounding tribes, especially the Nandi to the south of them. They have themselves been affected to some extent by the Samburu, the Enderois section of their tribe possessing a considerable amount of Samburu blood.

Konyi, *El Konyi*, or *Sabaiyot*.

One of the Mount Elgon tribes. They live in caves on the side of the mountain. They are divided into 9 clans, and possess 3 *laibons* (medicine-men chiefs). They trace their descent from the Kamasia, and are closely allied to the Sangwirr, a small tribe said to be of mixed Nandi and Masai stock.

Lago or *El Bawgek*.

This tribe lives at the foot of Mount Elgon, on the right bank of the river Malakisi. It is divided into three sections each under its own chief (1913) :

- (a) The Venyandet under Kepsteddi, 4 clans.
- (b) The Neketet under Chebukuto, 3 clans.
- (c) The Kaviemit under Werakai, 3 clans.

The tribe has migrated to its present position from the west side of Mount Elgon during the last 50 years.

Mogogodo or *El Mwesi*.

A small pastoral tribe in the foothills north of Mount

Kenya. It is doubtful whether they should be classified with the Nandi or the Masai group. In their organization and customs they have been much influenced by the Masai, but their language appears to be of Nandi type.

Nandi. A powerful and warlike hill tribe which formerly occupied the Nandi plateau. After the war of 1905 the Nandi were removed to a reserve farther north away from the railway.

They are closely allied to the tribes of the hill country south of the railway down to the southern frontier—the Lumbwa or Kipsikis, the Buret, and the Sotik or Soot. The Nandi are divided into 16 or 17 clans, but their political unit is a geographical one, the pororiet or district, of which there are 15. The whole tribe is under the authority of the *orkoiyot* who corresponds to the Masai *laibon*.

Ngoma or *Ngoma mek*. These are neighbours of the Lago and speak the same dialect of Nandi. They are said to have an admixture of Wamia blood. The tribe is divided into 7 clans.

Nyangnori, situated in 1902 at the foot of the Nandi escarpment north of Kisumu, on the borders of Kavirondo. They speak a dialect of Nandi, but have intermixed with the Bantu, a section of the Lakoli being incorporated in the tribe.

Suk. The Suk inhabit the hills west of the Kerio valley and north of the Endo country and also the plains north of Lake Baringo. They are divided into two main sections, the agricultural Hill Suk, and the Pastoral Suk of the plains. The latter moved down from the hills in recent times after the disappearance of the Samburu and Laikipia Masai.

They are an unwarlike people which has suffered greatly from the raids of their neighbours the Turkana. The Suk clans are of little importance, and do not correspond to their geographical divisions, which are

11 in number. They are badly organized and possess no true chiefs or medicine men. Their physical type has been considerably affected, especially in the plains, by the incorporation in the tribe of Samburu refugees.

NEGROIDS

The Bantu Coast Tribes

Wanyika. These tribes, with the exception of the Wapokomo of Tana valley and the Wateita of Taveta, are known collectively as the Wanyika or people of the wilderness. They include 4 large tribes—the *Girama*, *Rabai*, *Duruma*, and *Digo*, and 5 small ones farther to the east—the *Kauma*, *Chonyi*, *Dzihana* (Jibana), *Kamba*, and *Rihe* (Ribe). The Kawieni appear to be a branch of the Chonyi. The Girama inhabit a strip of country 10–15 miles inland from north of the Sabaki river to the river Mlegi. South of them come the Rabai, who are themselves separated from the Duruma by the Mtsapuni river. The Digo are mostly in what was German East Africa, but they have a few outlying villages south of Mombasa in the Shimba hills.

All these peoples have been affected by influence of the Swahili, and have supplied the latter with slaves.

Characteristic of these tribes are the tribal strongholds built on the tops of hills, and named *kayas*. They contain, besides a council house and a spirit hut, separate barayas for the different clans or sub-sections of the tribe.

Wapokomo. This tribe occupies the valley of the Tana from the neighbourhood of the Equator to 2° 30' S. They have intermixed considerably with the Wasania, and have also been considerably influenced by their neighbours the Galla. They are divided into 13 geographical sections *vyeti*, and 11 exogamous clans *-masindo*. The total number of the tribe is about 18,000. They are a conservative people, averse to leaving their country, and of little value as a source of plantation labour.

Inland Bantu Tribes

Akamba. The Akamba are divided into four main sections :

1. The Akamba of Ulu.
 2. The Akamba of Kibwezi.
- (These sections are administered from Machakos and number about 115,000.)
3. The Akamba of Kitui, numbering about 95,000.
 4. The Akamba of Mumoni, numbering about 25,000.

The Akamba are said to have been settled originally in Ulu, and to have crossed the river Athi about a century ago. Thence they spread gradually northward along the eastern side of the Yatta plateau to within 20 miles of the river Tana, where they join the Atheraka country. The Akamba are an intelligent tribe of passive but stubborn character. They despise manual labour and for this reason look down on the Akikuyu. They succumbed rather easily in large numbers to the fatigue and disease attendant on the recent military operations. They are a difficult people to deal with, being independent, distrustful, and obstinate.

Akikuyu. The most well known and perhaps the most important people in British East Africa. The Akikuyu proper inhabit the country between Nairobi, the Aberdare Range, and Mount Kenya; but the tribes east of Kenia, the Ndia and the Gichugu, the Embu, the Mbere and the Mwimbe, are also usually classed with them. The Akikuyu claim to be derived from the Akamba, but they are less purely Bantu in type than the latter, owing to a slight intermixture of Masai and Dorobbo blood.

In character the Kikuyu are a comparatively submissive and industrious people. They form the chief supply of labour in the Protectorate and are more willing to work for wages than are the other native tribes. In outward appearance and minor characteristics they vary considerably, as they tend to assimilate

themselves to their immediate neighbours such as the Akamba and the Masai.

Atheraka. The Atheraka live on both sides of the Tana river between the Akamba and the Akikuyu countries. In type and language they also occupy an intermediate position between the two larger peoples, approximating most closely to the Akikuyu. They are an extremely shy and exclusive people, rarely venturing beyond their tribal boundaries, and were among the last peoples in this region to submit to the British Government. In dress and customs they are very primitive. They have preserved their clan division more perfectly than either of the neighbouring peoples.

Chuka or Shuka. A small tribe on the south-eastern slopes of Mount Kenya between the Embu and the Meru. They are closely allied to the Akikuyu, but they show certain differences in physical type which seem to suggest intermixture with an aboriginal negroid stock. They are greatly despised by the Akikuyu, who credit them with eating hyenas. The Akikuyu themselves will only eat beef, mutton, and goat flesh.

Meru. A very large tribe, living north and north-east of Mount Kenya and in the Jombeni Hills. They differ considerably from the true Akikuyu, and are said to possess some admixture of Masai (Laikipia) blood. They are divided into about 22 geographical sections each under its own chief. They also have totemistic clans, called Mwiria, about 13 in number. There is no paramount chief.

The Kavirondo Peoples

A. Bantu.

The Bantu Kavirondo occupy the western districts of the Protectorate south of Mount Elgon and north of the southern frontier. Their country is divided into two parts by a broad band of territory round the Kavirondo Bay, which is occupied by the Nilotic Jaluo.

The following are the principal tribes as given by Mr. C. W. Hobley in 1902 :

Awa-Isukha. A large tribe situated on the extreme east of the Kavirondo country between the river Yala (or Lukos) and Kabras. Large population, which produces great quantities of food. The tribe is divided into 11 sections, which are much given to quarrelling among themselves.

Awa-Ithakho. A large tribe occupying both sides of the river Yala west of the Tiriki and Isukha country, 7 or 8 sections, which have no important chiefs and are consequently somewhat unruly.

The eastern Wa-Ithakho and the Awa-Isukha are known collectively as *Kakamega*.

Awakabras or *Kamalamba.* One of the most easterly tribes of Kavirondo, lying at the foot of the Nandi escarpment and south-east of Ketosh. They have been influenced by the Nandi, and have intermixed slightly with the Konyi and the Uasin Gishu Masai. Their language is an archaic form of that spoken by the Awawanga. Six sections.

Awaketosh or *Masawa.* The most northerly of the Bantu Kavirondo. They occupy the country north of the river Nzoia between Mumias and Mount Elgon. Ten sub-divisions.

The Awatatsoni who lie north of Kabras, and are sometimes included in that district, are really also a section of the Ketosh.

Awakisa. A tribe without important chiefs, which formerly acknowledged the suzerainty of Mumia of the Awawanga. They are situated between the river Yala and the river Lusimo. Four sections.

Awakisingiri. A tribe occupying the coast of Lake Victoria north of the southern frontier. Allied to the Awaware. They make large quantities of salt.

Awaksii. This tribe is often known by the Masai name of *Kossova*. A large but little known people, extending from 30 miles south of Kisumu to the southern frontier. 42 sub-divisions.

Awalewi or *Kikelelwa*. A small tribe in 1902 dwelling on the river Nzoia north of Sakwa's. They are said to have migrated from the Elgumi country. Two sub-tribes.

Awalakoli or *Maragoli*. South of the river Yala between the Awa Ithakho and the Awa Mangali, with whom they are unfriendly. Large population. Divisions :

Awamawe with 6 sub-divisions.

Awakirima with 5 sub-divisions.

Awakisungu with 4 sub-divisions.

The Awa Kisungu, whose country lies between Lakoli and Tiriki, are sometimes regarded as a separate tribe.

Awamangali. South of the river Yala and north-east of the Maragolia Hills. A quarrelsome people, which has given trouble to the Administration in the past. Said to be an offshoot of the Awanyole. Six sub-divisions.

Awamarama. South of Mumias. They have no important chiefs of their own, but recognize (1902) the suzerainty of Mumia. Six sub-divisions.

Awamrashi, &c. A small group of tribes north of the river Nzoia between Mumias and the Samia Hills. They include the Awasheshi (3 sub-divisions) and the Awasamia, who are great iron workers.

Awamuteti, situated south of the Awa Mangali and north of the Awalakole. Nominally allied to the former, but there is much friction with their neighbours (1902) owing to over-population and the need for expansion. They are said to be an off-shoot of the Nyole.

Awanyala, on the frontier near the mouth of the river Nzoia. Very friendly in disposition. Six sub-divisions.

Awanyole, south of the river Yala near the Maragolia Hills. Their chief Mgahanya used to be the chief rain maker of Kavirondo. Seven sub-divisions.

Awatiriki, south of the river Yala on the edge of the Nandi escarpment. Four sub-divisions.

Awatsoso. A small tribe near the river Isukha east and south-east of Sakwa's. Six sub-divisions.

Awawanga. They occupy the central Nzoia valley. The most important tribe in Kavirondo. More powerful and civilized than any other. Their head chief was (in 1913) Mumia, but Tomia the son of Sakwa is also an independent chief. Seventeen clans, of these the most important is the Wakhitsetse, which claims descent from Wanga. To this clan the chiefs belong.

Awaware or *Wachulu*. This tribe inhabits the islands of Lusinga and Lufangano at the mouth of Kavirondo Bay. Eight sub-divisions.

B. Nilotic or Jalu.

Aiendi. Inhabit mainland opposite Lusinga Island. Five sub-divisions.

Gemi or *Kami*. South of the river Nzoia between Mumias and Kavirondo Bay. Their country is the greater part of the lower Yala valley. They are the second tribe of Kavirondo in importance. Head chief in 1902 Odera Ululo. Six sub-divisions.

Kaki. A small tribe, allied to the Lego and Songa. They live near Gangu Lake and the delta of the river Nzoia.

Kalachonyo. A large tribe south of Kavirondo Bay. They stretch from west of Nyakatih country to the west side of Uma or Oma Mount. Thirteen sub-divisions.

Kanu or *Kidobo*. They inhabit the alluvial plain east of Kavirondo Bay. Large population growing vast quantities of food. Friendly in disposition. In 1902 the principal chief was Kitoto, whence the tribe was often known as the Wakitoto. Nine sub-divisions.

Khoro. A branch of the Nife which migrated in recent times from the river Nzoia, and settled between the Lego and the Gemi. Four sub-divisions.

- Kisumu.* Habitat south-west of the Maragolia Hills and on the lake shore round Kisumu. Ten sub-divisions.
- Lego.* Habitat south of the river Nzoia and west of the Gemi country. Part of the tribe acknowledged the supremacy of Mumia the chief of the Awawanga. Nine sub-divisions.
- Nife* or *Nyife.* Habitat on the south bank of river Nzoia on the road from Mumias to Port Victoria, a few live on the south bank of the river. Two sub-divisions.
- Nyakach.* Habitat on the south-east side of Kavirondo Bay. Formerly much raided by the Lumbwa. Very friendly in disposition. Six sub-divisions.
- Ramba.* Habitat south of Kavirondo Bay opposite the Uyoma country. Ten sub-divisions.
- Sawakwa* or *Sakwa.* Habitat on the lake shore west of the Gemi country. Six sub-divisions.
- Sembo.* Habitat on the north side of Kavirondo Bay, south of the Gemi country. In 1902 they acknowledged to some extent the supremacy of Odera Ululo, the Gemi chief. Two sub-divisions.
- Semi.* Habitat west of the Sembo and south of the Gemi with whom they were formerly unfriendly. Seven sub-divisions, one of which, the Kadipelo possesses five sub-sections.
- Songa.* A small tribe situated south of the river Nzoia near Port Victoria.
- Timu* or *Utimu.* Habitat on the lake shore south of river Nzoia. Their country is called Kadimu and they are known as Wayimbo by the Bantu. Three sub-divisions, one on the lake shore, the others inland.
- Uyoma.* Habitat at the entrance to Kavirondo Bay on the north shore. Four sub-divisions.

CHAPTER VII

HARBOURS, TOWNSHIPS, AND SETTLEMENTS

Part I, Ports and Coast Towns. Part II, Inland Towns and Settlements.
Part III, Towns and Ports on the Lake

THE following notes on the harbours, townships, and settlements of British East Africa begin with those on the coast of the Indian Ocean, arranged in order from south to north.

The inland townships and settlements begin with Nairobi, and are, after that, arranged in alphabetical order.

Lastly the harbours on Lake Victoria are dealt with, beginning at Kisumu.

Many places, which have been proclaimed as township areas, are still very undeveloped, consisting often of a mere handful of Europeans and Indians and a few huts. The railway station, with its post office, forms the nucleus in the case of those on the Uganda line. These serve as centres for the settlers of the surrounding districts, and are in many cases rapidly expanding. Possibly a few settlements of equal importance to those given have been omitted. Statistics of the population of the actual townships, as distinguished from those of the districts, have been rarely obtainable.

PART I

PORTS AND COAST TOWNS

Vanga and Mouth of the Umba

Vanga is situated on the river Umba, which forms a delta with three mouths.

1. The most southerly is river Yimbo or Jimbo, 200 yds. wide at entrance. It is a separate stream, but connects with Umba about 1 mile from the sea.

2. The second entrance to Uмба river is about $1\frac{1}{4}$ mile north of Yimbo. There are two channels, the southern one blocked with sandbar.

The ruins of the old town of Vanga are just within the entrance on the southern bank.

The present town is on the same bank, $\frac{1}{3}$ mile farther up.

3. The third entrance is 2 miles north of the second entrance. It unites with the second 2 miles from the sea at the large village of Mgoa. The best place for landing troops and stores is at Mgoa.

At low water the Uмба is dry down to the mouth; at high water dhows can enter, but cannot proceed farther up than Mgoa.

Vanga is a walled town with a native population of about 2,000. It is the chief town of Vanga district, with a post office. Formerly customs station between British and German East Africa. The pier has been destroyed, and landing is difficult. There is a considerable export of mangrove poles for building purposes.

Immediately behind the town is a large extent of low-lying flat land; the soil is black alluvial mud, periodically flooded where rice is cultivated.

The locality is dangerously unhealthy and malarious, owing to the large swampy area.

The country round is fertile in coco-nuts, rice, and all vegetables which thrive in much moisture. The climate is not unlike that of southern India, and Indians probably find it a congenial home. At present cultivation suffers from the dearth of population. Several small villages of the Wadigo tribe are situated near Vanga.

Wasein Island, Town, and Harbour

Wasein Island, of coral formation, lies 1 mile to south of the broad Shimoni peninsula. It is 3 miles long in an east and west direction, 1 mile in width. Altitude above sea-level, 70 to 90 ft.

Wasein town is situated north-west side of the island.

Pop. 1,000. 220 huts. 3 mosques. It is an Arab town of some antiquity, and the chief market for borities or mangrove poles. The creeks along this stretch of shore are lined with thick fringe of mangrove, which often attains large dimensions, many of the spars being 60 to 70 ft. long, perfectly straight, and 2 ft. thick at a man's height from the ground. A large amount is sent to Zanzibar.

There is a fairly extensive mangrove bark industry, the bark being shipped to Europe for tanning purposes.

Landing difficult at low water owing to reef fronting town.

Wasein harbour is in the channel between the island and the mainland. The shore of the mainland is fringed with mangrove, and backed by low coral cliffs, in which are some remarkable caves.

The channel has a uniform width of about 5 cables, with a reef fringing the shore on either side at a distance of from 1 to 2 cables, and a general depth of $5\frac{1}{2}$ to 9 fathoms. Within the eastern entrance there are depths of 12 to 14 fathoms in fairway. The anchorage is safe in all weathers.

Ras Mundini, the north-west point of Wasein Island, has a square white pillar on it.

Off the north-east point of island is a pinnacle rock drying 10 ft.

Funzi

This is a small village, situated on the west side of Funzi Island, towards its southern end.

Funzi Bay is bounded by the island to north-east, and to south-west by the promontory of Ras Rashid, which projects eastwards from the peninsula of Shimoni. The bay lies north of the eastern entrance to Wasein harbour and is $2\frac{1}{2}$ miles in width between Ras Rashid and south point of Funzi Island.

The western side of the bay, into the head of which runs the river Ramisi, affords fairly good anchorage; depths at entrance 6 to 7 fathoms, and from 4 to $4\frac{1}{2}$ at the anchorage.

The eastern side of the bay is shoal water, through which a channel, used by dhows, runs to Funzi village

Gazi

This is an Arab village, 23 miles SSW. of Mombasa, with customs station and P. O., consisting of about 100 native huts built in regular rows, and one large and conspicuous white house. There is a small garrison under a British officer. Gazi is the terminus of the coast road, which runs from the southern side of Kilindini harbour. The town is situated to the north-west of Gazi Bay, which lies west of a long promontory projecting southwards, known as Chale Point. Immediately south of the point is Chale Island, which, with its tree tops 60 ft. above sea-level, forms a prominent feature on that part of the coast.

A reef stretches about 2 miles south-west from the island ; the depths at the entrance of the bay are 4 to $4\frac{1}{2}$ fathoms. The 3 fathoms contour line is $1\frac{1}{2}$ mile from the head of the bay.

Landing at Gazi is effected at low water partly by wading, about $1\frac{1}{4}$ mile south of town. A path leads into Gazi from this landing-place. At high water boats can land at the town itself. There are large sisal plantations in the neighbourhood.

Tiwi

Situated to the north of river Mwachema, about 3 miles back from coast, 12 miles north of Gazi, and 13 miles SSW. from Kilindini harbour on the coast road. Till lately Tiwi was only a native town with a certain Arab element ; recently, however, the district has been exploited by Europeans for tropical products, and there are now large sisal plantations in the neighbourhood.

Mombasa

The township of Mombasa includes (1) Mombasa Island, (2) a circle of 2 miles round Freretown and English Point on the mainland to the north-east, and (3) an area extending 1 mile inland between Ras Muaka Singe (see below) and Mukungune on the mainland to the south-west.

There are very few dwellings at Freretown, which is a purely missionary settlement, or English Point.

Pop. 27,000 with about 350 Europeans.

Situation and Description of Mombasa Island.—Mombasa Island is inserted in a deep arm of the sea, running up from the Indian Ocean into the land, and surrounded with forests of palm trees. It is embraced by the mainland on three sides.

The island is roughly oval in shape, and is 3 miles long in a NNW.—SSE. direction, by 2 miles broad.

Altitude, 40 to 60 ft. above sea-level.

The island is mainly composed of coral, with sandstone in places. The coral crops out inside the island in many places and affords valuable building material.

The vegetation is luxuriant, baobab and mango trees being especially prominent. The surface of the island is level.

The shore is steep all round, and except on the north and north-west sides there is deep water close in to the land.

Description of Mombasa Town.—The town of Mombasa is situated on the east side of the island, $\frac{3}{4}$ mile up from the sea, and the settlement of Kilindini on the south-west.

Mombasa is the chief town of the province of Seyidie. It contains a residence retained for the governor (usually resident at Nairobi), known as Government House, and the residences of the provincial commissioner, provincial judge, and chief of customs.

There are a P. O., T. O., and telephone exchange, both at Mombasa and Kilindini. The Eastern Telegraph Company has a station at Kilindini. A telegraph line, with 3 or 4 wires, runs alongside the Uganda Railway from Mombasa to Kisumu. There is a submarine cable to Zanzibar, and land wires to Lamu and along the coast to Tanga.

The town is divisible into three sections :

(i) Eastern section, inhabited chiefly by Muscat Arabs, better class Swahilis, Indians, and Goanese, and called Stone Town. It is closely built over with large irregular buildings, interspersed with small and low buildings and huts, and intersected with narrow passages and lanes. It lies along

Mombasa harbour, and is the business quarter of the town. The retail trade is largely in the hands of Goanese.

(ii) Northern section, the oldest part of the town, is not nearly so crowded as eastern section. It consists of a few stone houses, generally in a state of decay, with native huts ; and is inhabited by Swahilis, Shihiris, Badalis, and the fisher class.

(iii) Western section, the highest in level, as the eastern is the lowest. It consists principally of makuti huts, regularly arranged, and fairly cleanly kept. Population, chiefly Swahilis and Africans from the interior, who have become Islamized and have adopted Swahili modes of life.

The English Government officials reside in a district to the south of the town, known as the Ras Serani Area or the Point. It is a stretch of high ground, terminating to the south-east in the promontory of Ras Serani. It is exposed to almost continuous winds, and is cool and healthy.

The main thoroughfares are (1) Vasco da Gama Street, leading to the customs house through the old part of Mombasa, closely packed with houses old and new built in the Arab style ; (2) the Kilindini Road, which runs from Mombasa to Kilindini. It is lined with a magnificent avenue of mangoes. There are many European houses along it ; (3) the Coast Road, which runs south through the European quarter, and follows the shore of the island round to Kilindini ; (4) Salim Road, running NNE. from the Kilindini Road, west of Mombasa town, to a ferry on Ras Kiberamini ; (5) Makupa Road, running north-west across the island to Makupa Channel, which it reaches just west of the Salisbury bridge.

Government buildings and institutions.—Government House, with grounds, a little to the north of Ras Serani ; residence of sub-commissioner ; High Court of East Africa, opened in 1902, where both British and Mohammedan law are administered ; public gardens, containing statue of Sir William Mackinnon, Bt., founder of the Imperial British East Africa Company ; hospital for Europeans, near the shore to the south of the town ; hospital for natives in the Salim Road,

a little to the north of the Kilindini Road ; quarantine station in the Kilindini Port Area ; police lines to the north of the Kilindini Road ; the Fort, the most prominent building in Mombasa, is situated immediately to the south of the old part of Mombasa. It is quadrangular in shape, yellow and weather-beaten with age. It was built by the Portuguese in 1593. The red flag of the Sultan of Zanzibar flies over it. It is now used as a prison, one of the two first-class prisons in the Protectorate, the other being at Nairobi. The prisoners are taught various industries.

Other buildings and institutions. — Hotels : Metropole, on north side of Kilindini Road ; Africa, inside the town.

Banks : National Bank of India ; Standard Bank of South Africa ; National Bank of South Africa.

Churches : cathedral, erected 1905 to memory of Bishop Hannington ; Roman Catholic church, in charge of the Mission of the Fathers of the Holy Spirit.

There are some small mosques in the town, and a Hindu temple to the north of the Kilindini Road.

Buxton high school for boys, in connexion with Memorial Cathedral.

Convent school for girls.

Mission schools : The C.M.S. has three schools under direct European control, and one in charge of native teachers.

The Roman Catholics have three schools, one of which is under European management.

• Hostel of the White Fathers.

Clubs : Mombasa ; Sports ; Yacht ; Island ; Golf.

There is a public trolley service.

The trolley is the vehicle of the island. It is a plain four-wheeled truck, provided with awning and seat for two. It runs upon rails of ordinary tramway type, and is pushed by natives. The rails run everywhere. All the main thoroughfares are laid with them, and there are branches to private houses. Recently the trolley lines in some parts have been taken up and relaid to secure greater road width. The Kilindini Road has been widened in this way by 4 ft. From

the Treasury to the Customs House the lines have been removed altogether, and the road widened by 8 ft. At Kilindini the trollies start from left of road, 250 yds. from Customs House.

There is nothing that can be called a town at Kilindini. Before the transference of the Uganda Railway head-quarters to Nairobi there was a flourishing settlement of railway officials. Post office closed 1905. With recent development of Kilindini harbour there has been some building in the locality, mainly warehouses, and some residences for the European staff of various companies.

Uganda Railway.—Mombasa is the coast terminus of the Uganda Railway. As the railway was originally built from Kilindini, the mileage is reckoned from that place, and not from Mombasa.

Mombasa station, a little to the south-west of the Fort, and close to the public gardens, is built of stone, and approached from the harbour by a narrow and tortuous road. It includes inward and outward goods sheds of 1,500 tons' capacity; one fixed crane of 2 tons' hoisting capacity; and a small station yard, surrounded by a 6-ft. corrugated iron fence.

The Public Works Department and Mombasa Electric Light Company have private sidings.

Passenger trains leave daily for Nairobi, and five times a week for Kisumu.

The line from Mombasa, single track, runs westward across the island to Kilindini, where it turns north-west into Kilindini station.

Kilindini station is situated to north of the Kilindini Road, and built of coral.

It has a large station yard, surrounded by 6-foot corrugated iron fence; fuelling yard; medium-sized goods shed; engine shed to take 4 engines; small carriage shed; small workshops; and a good supply of water is pumped from a well.

A loop line from Kilindini pier connects with the main line at Kilindini station.

Parallel with the single track of the Uganda line from

Mombasa to Kilindini, another single track runs to a point near Kilindini, and then branches off and runs down to Kilindini pier.

From Kilindini station the line runs north by west, and then, curving to the north-east, turns north-west and crosses Makupa Channel by the Salisbury bridge to mainland, at a point where the channel is practically dry at low water spring tides.

The Salisbury bridge has 21 spans of 60-ft. girders on iron screw piles and 5 spaces of 12 ft.

South-west of Salisbury bridge a branch line runs down to the Magadi Soda Company premises at the north-west corner of the island.

Climate, health, sanitation.—The climate is trying to Europeans, especially during hot season, December to end of March. The mean maximum shade temperature is 82·9° F., mean minimum 73·1° F. The greater rains occur in April and May, the lesser in October and November. Total annual rainfall about 47 in.

Malaria is common, and is the chief cause of ill-health.

The island, however, cannot be called unhealthy. (i) It faces the Indian Ocean, and enjoys for the greater part of the year the benefit of the north-east and south-west monsoons. (ii) The broad waters of Port Reitz and Port Tudor, two large inlets of the sea behind the island, secure for it, during the changes of the tides, the washing of its shores with strong currents, which sweep away all impurities and render stagnancy impossible. (iii) The soil of the island is composed of coral and sandstone, both extremely porous, so that even after heavy rains water disappears at once almost everywhere. Improved sanitation and the cultivation of the surrounding country would probably render it one of the healthiest places in the tropics.

The eastern section of the town of Mombasa, Stone Town, is an insanitary area. The ground slopes down to it from west and north, and water collects and stands after rains. It is in this part that the incidence of plague has been greatest.

The Kilindini side of the island is popularly regarded as less healthy than the Mombasa side, being farthest removed from the sea.

Water supply.—The water supply is under the control of the P. W. D. Water is brought to Mombasa from the Shimba hills. In 1916 the head works were at Mreri, and the first service reservoir at Changamwe was finished; the carriage of the main across Makupa bridge was practically completed, and the distribution system on the island carried to an advanced stage. Total expenditure on water supply up to March 1916 was £96,000.

Water is also obtained from stored rain-water and from wells sunk in the coral reef limestone or Kilindini sands. The wells are 65 to 70 ft. deep, i. e. they are sunk to sea level. Such a well of ancient construction is in the courtyard of the Fort at Mombasa. The water is hard and slightly brackish.

Port of Mombasa.—The port includes four distinct harbours: Mombasa to east, Port Tudor to north, Kilindini to south west, and Port Reitz to west.

Kilindini is the principal harbour of British East Africa, and is the port used for general traffic. Mombasa is used for local traffic. Neither Port Reitz nor Port Tudor is normally used for ordinary commercial traffic.

Mombasa harbour is on the north-east side of the island, facing the town.

The entrance lies between Ras Serani on the island to south-west, a promontory 66 ft. in height, and a broad rounded peninsula on the mainland to north-east. The south-western extremity of this peninsula is known as Mackenzie Point. The channel between Ras Serani and Mackenzie Point is 6 cables broad with a depth of $5\frac{1}{2}$ fathoms.

The eastern shore of the island, forming the western side of Mombasa harbour, is 3 miles long in a NNW. and SSE. direction. The harbour is $1\frac{1}{2}$ mile long. Its general width between shoal waters on either side is $1\frac{1}{2}$ cable. It is nowhere more than 1,200 yds. wide.

There is anchorage off the town in 8 fathoms, but both

north and south of this there are depths of from 12 to 18 fathoms.

The harbour is used by small steamers and native craft which trade with Persia, India, and Madagascar, and large sea-going dhows plying between Zanzibar and the Red Sea ports. It is the centre for trade with Bombay, and there is a coastal service to Kilifi, Malindi, Lamu, and Kismayu, which covers the 364 miles between Mombasa and Kismayu in from 3 to 5 days. Two or three small steamers belonging to rival Indian firms are engaged on this service, and run at irregular intervals.

Two iron piers, one having steam crane, extend from opposite the custom house.

The Customs head-quarters are at Mombasa, but much of the work is done at Kilindini.

Pilots can be obtained between sunrise and sunset. A tug^{*} is available, and there are lighters with a capacity from 20 to 130 tons. The railway does not come down to the harbour ; Mombasa railway station is reached from the harbour by a narrow and tortuous road.

Port Tudor lies north of Mombasa harbour, with which it communicates by a narrow and winding but deep channel, with steep wooded banks.

Port Tudor is not used for shipping. Owing to drying banks the anchorage is limited to a width of less than $1\frac{1}{2}$ cable. Several channels pass through the banks, one to the northward leading to the river Jomru, which may be ascended at high water for several miles. The southern shore of Port Tudor is the northern part of Mombasa Island, and is known as Kwamwama.

Port Kilindini lies in the channel on the south-west side of the island. It is reputed the finest harbour on the east coast of Africa, being 3 miles long, with a general depth of 20 fathoms, and in places 35 fathoms, and available for all classes of vessels.

The entrance is between the south-west shore of the island and the promontory of Ras Muaka Singe on the mainland,

with a least depth of 11 fathoms. From this point the mainland shore curves round north-west and north for nearly $3\frac{1}{4}$ miles, with Mueza Creek about half-way. The land behind rises abruptly to 150–200 ft. The shore to north of Mueza Creek is known as Mtonga, and it terminates in a narrow peninsula projecting northwards, $\frac{3}{4}$ mile in length, called Ras Kigangone or Flora Point.

The island shore trends south-west from Ras Serani to Ras Mzimili, after which a stretch of shore, $\frac{3}{4}$ mile in length, faces south to the Indian Ocean. Beyond this it curves round north-west opposite Ras Muaka Singe to the mouth of Mbaraki Creek, which runs northwards up into the island for $\frac{1}{2}$ mile, almost filled with a drying bank. One mile north of Mbaraki Creek is Ras Kilindini, projecting westwards from the island, and from this point the shore trends NNW. for another mile to the north-west point of the island.

The channel between the island and the mainland is from $\frac{1}{4}$ to $\frac{3}{4}$ mile broad.

The wharf and customs house are on Ras Kilindini, and face south. North of this lies Kilindini Railway and Port Area.

The wharf, known as Kilindini pier, 550 ft. long, built of concrete blocks, is intended only for unloading of lighters, and is not suited to any class of deep-sea vessel. Large steamers anchor in the harbour, and are unloaded by lighters. When the projected improvements are completed, it will be possible to berth vessels of all sizes alongside a deep-water pier.

There is a pontoon landing-stage for passenger accommodation, 50 ft. long by 20 ft. broad. Kilindini pier is worked by the traffic department of the Uganda Railway.

A branch line from the Uganda Railway runs from Kilindini station along the quay to opposite the customs house. Goods are loaded direct from lighters into railway trucks. In 1913, quick-working straddle cranes for unloading lighters were ordered, and also an electric light installation for more efficient night work. In the same year a new brick baggage room was built.

On Kilindini pier are the following cranes: one 20-ton,

two 10-ton, three 5-ton, two 3-ton. A 10-ton movable crane is available in the stacking yard.

Working hours on Kilindini pier are from 8 a.m. to noon and 2 to 5 p.m. from Monday to Friday, and from 8 a.m. to noon on Saturday. On Sundays it is closed.

Considerable improvements are projected for the harbour.

About 4 cables south-east of Ras Kilindini is a pier for carrying pipe to oil tanks belonging to Shell Transport Company. About same distance south-west of Ras Kilindini there is a small pier on mainland. A considerable area between Ras Kilindini and Mtonga, south of the peninsula of which Ras Kigangone is the extreme, belongs to the Admiralty for naval purposes.

At the north-west corner of the island the Magadi Soda Company has a dépôt with pier, and a branch line connecting with the Uganda Railway.

The shore end of submarine cable connecting with Zanzibar is marked by a telegraph buoy midway between Mbaraki Creek and Ras Kilindini.

The following lines of steamers visit Kilindini. (N.B. All steamer services have been greatly dislocated during the war.)

(i.) Union Castle Mail Steamship Company.

Royal East African service started by this company in 1910 from London and Southampton to Kilindini. Every 28 days. Calling at Marseilles, Naples, Port Said, Suez, Port Sudan, Aden. Homeward service also every 28 days.

From Kilindini the steamers continue their voyage down east coast as far as Durban, calling at Zanzibar, Mozambique, Beira, and Delagoa Bay.

(ii.) Messageries Maritime Steamship Company.

Once every calendar month from Marseilles to Kilindini, calling at Port Said, Suez, and Dyibouti (Jibuti). From Kilindini these steamers continue their voyage to Madagascar and Mauritius.

(iii.) Italian East African Line (Marittima Italiana).

Every 28 days from Genoa to Kilindini, calling at Naples, Alexandria, Port Said, Mogadiscio, and Kismayu, and, before

the war, continuing to Zanzibar, an arrangement which will probably be resumed.

(iv.) British India Steam Navigation Company.

This company has two services :

(a) Fortnightly, Bombay to Mombasa harbour, run under subsidy from Indian Government.

(b) A 28-day service from London via the Suez Canal to Mombasa and East African ports.

(v.) Clan, Ellerman, Harrison, and Hall Lines Joint Service Steamers.

Once a month to Kilindini direct from Europe with cargo only.

Port Reitz (Banderia Kipeyu).—Port Kilindini communicates with Port Reitz to north-west. The entrance to Port Reitz is between the peninsula terminating the mainland shore of Kilindini harbour to south, and Ras Mchangamwe to north, $\frac{1}{2}$ mile apart. It extends due west for 3 miles, with a breadth of 3 cables between shoal water on either side. For the first mile the depth is 6 to 15 fathoms, for the second mile $3\frac{1}{4}$ to $4\frac{3}{4}$ fathoms, deepening for the third mile to from $5\frac{1}{2}$ to 11 fathoms. The bottom is mud. River Mwachi enters north-east, and river Cha Shimba or Pemba south-west end of Port Reitz.

Makupa Channel.—Port Kilindini communicates north-east with Makupa Channel. It separates the island of Mombasa from the mainland, and communicates north-east with Port Tudor. It is narrow, and runs nearly dry at low water. It is crossed by a ferry, and at its northern end by Salisbury bridge.

Mtapwa

Mtapwa is a small port with a poor and shallow harbour, about 8 miles NNE. of Mombasa. There is a creek to the south of it which would be convenient for shipping if trade increased. There is deep water in the creek, but the channel is intricate. It has been ascended by boats for 6 miles. There is a reef abreast of the creek, with a passage through it.

Takaungu

Pop. 1,300, mainly Arabs and Swahilis, and including some Indian traders. P. T. O. Telephone to Mombasa, the line between Mombasa and Lamu being utilized for this purpose during certain hours. Takaungu is situated on the southern bank of a winding inlet of the sea, known as the Senawe river, about $\frac{1}{2}$ mile within the entrance, and 28 miles NNE. of Mombasa.

It is a walled town, surrounded by coco-nut groves, with several small mosques, and between 300 and 400 huts and houses. The houses are built of red earth, and thatched with grass or coco-nut cadzans, many having small gardens. There is a bazaar with Indian shopkeepers and merchants ; a fort which always hoists the red ensign of Zanzibar ; and the residence of the district officer, a whitewashed house to south-east of the fort. Takaungu is stated to be a thriving place.

The Senawe river is about 100 yds. wide opposite the town, and runs between rocky bluffs. At low water the stream is confined to a narrow channel at north side, all the rest being uncovered. At or near high water dhows can get up to the town. There is a ferry across the river to the main coast road, leading northwards.

The water supply is plentiful ; it is drawn from numerous wells, two of which are built of stone.

The surrounding country is well cultivated. It contains many farms where grain is raised and exported, and fairly extensive European-owned plantations of sisal fibre. The soil is rich and loamy.

Kilifi Creek

Kilifi Creek is some 35 miles NNE. of Mombasa, and about 3 miles north of Takaungu. It is a long winding inlet of the sea, with a general east and west direction, having high precipitous banks, and expanding westwards after $1\frac{1}{2}$ mile into a wide basin known as Bandaria Ya Wali. The forest of Sekoki or Arabuko comes down to its northern shore.

The entrance lies between cliffs 70 to 100 ft. high, with a depth at low water of 6 fathoms. Only vessels of moderate draught can use the harbour, as the channel between the reefs bordering the entrance channel is not more than 1 cable wide between the 5-fathoms line. Inside them is a depth of from 12 to 20 fathoms. The basin into which it expands is well sheltered, but shallow at the western end.

The land telegraph line from Mombasa to Lamu crosses Kilifi Creek between two tall posts at a height of 68 ft. above high water.

The local service steamers from Mombasa to Malindi, Lamu, and Kismayu call at Kilifi Creek and anchor outside the entrance.

The chief drawback to the place is the want of good water, the only supply being rather brackish.

The principal village is Mnarani, situated below the cliffs, on the south side, about 1 mile from the sea. There is a population of 300, mainly engaged in agriculture. The creek is very deep and narrow opposite the village, and is crossed by a ferry. The old ruined town of Kilifi lies a little to the west.

At the western end of the basin is the village of Mtanganyiko, where a pier has been built to facilitate the export of grain. The river Voi from the north, and the river Ndsoruni from the south-west unite above Mtanganyiko and enter Kilifi Creek.

Malindi

Pop. between 4,000 and 5,000, principally Arabs and Swahilis. P. T. O.

The town is situated on a coral beach on the south-west side of a shallow bight, $4\frac{1}{2}$ miles south of the mouth of the river Sabaki. It is a straggling town with several fair-sized houses, a small fort which usually hoists the ensign of Zanzibar, and the residence of the district commissioner.

There is some European settlement in the district; but the cotton planting was not a success.

Water supply, from deep wells of ancient construction, is good.

To the south of town on a small point is Vasco da Gama's Pillar, erected to commemorate his visit to Malindi in 1498. The pillar, 18 ft. high and bearing the arms of Portugal, is a prominent landmark.

Malindi harbour is shallow and the anchorage is poor. There is a pier for small boats only. Steamers have to lie a considerable distance off shore.

The local service of steamers from Mombasa to Kilifi, Lamu, and Kismayu call at Malindi, and there is a regular trade by dhows with Muscat in millet. The dhows arrive when harvest is over, to ship grain.

Malindi district, which has a total pop. of 20,000, is the most productive on the coast. Millet and sesame are especially cultivated.

Mambrui

This is an old Arab settlement (pop. with adjacent villages, 1,250) ; situated 3 miles north of mouth of the river Sabaki. The Sabaki is shallow, and only available for canoe navigation.

North of the Sabaki, the land rises into a coastal range, forming Mambrui Point, $2\frac{3}{4}$ miles north-east of the mouth of the Sabaki ; Mambrui is on the north side of the point. The town contains some old buildings and some good new ones.

The Wali has built himself a substantial house in the European style, and also a hall for public meetings. There is a remarkable leaning pillar, 20 ft. high, the origin of which is unknown.

In the centre of the village are a conspicuous white house and tree ; a little way inland are the well-known shambas of Magarini.

Kipini and Kau

Kipini (pop. about 1,000 Swahilis ; P. T. O. ; telephone to Lamu) is situated on a promontory east of the mouth of the river Ozi, 17 miles ENE. of the mouth of the Tana.

The town consists of the residence of the district com-

missioner, who through his native clerk conducts the post and telegraph offices ; and a cluster of huts round the small fort which commands the entrance to the river.

Kau (pop. 800 Swahilis) is situated 8 miles up the Ozi from Kipini, on an island formed by the Ozi on one side, and its tributary creeks and streams. It has a substantial stone-built fort. There is no good water supply ; water is obtained from good wells at Kisanga some miles to south-west.

At Charra, $3\frac{1}{2}$ miles in direct line from coast, the Tana is connected with the Ozi by Belezoni canal, about 2 miles in length, through which native boats pass to Kau and Kipini. There is a customs house at Charra.

The bar at the mouth of the Ozi can only be crossed at high water. Once it is passed, dhows can go at any time up to Kau where the Ozi ceases to be tidal. There is a thick growth of mangroves on either side of the river, in some places 300 yards in breadth.

Kipini and Kau together form the chief market for the produce of the rich Tana district.

Lamu Island, Town, and Harbour

Lamu Island.—Pop. 12,000. Lamu is the most westerly island of the Lamu archipelago. It is $6\frac{1}{2}$ miles in length, of coral formation, low, flat, and cultivated. The soil consists of coral reef, and deep white sand.

Lamu Island stands in a concave curve of the mainland, which surrounds it on the west and north. It is separated from the mainland by a narrow channel, Mlango Kipungani, curving round to north-eastward from Lamu Bay, and deep enough for large boats even at low water, though the entrance is obstructed by a shallow bar.

To eastward, Lamu is separated by a narrow channel from Manda Island ; to southward is Lamu Bay, $6\frac{1}{2}$ miles wide between Ras Kitao, the south-west point of Manda Island on the north-east, and Dongo Kundu on mainland to south-west. The latter is a rounded promontory, 221 ft. high, having on it a conspicuous sandhill.

Sand-dunes ranging from 30 to 250 ft. in height form the only high ground on Lamu Island. To the south of the present town of Lamu is the hill of Hebadu, a group of sand-hills of recent accumulation, which has completely buried the old town to depth of 50 ft. On the beach beneath, where the sand has been washed away, broken walls of houses project.

The chief article of cultivation is the coco-nut, which thrives in Lamu if properly attended to, and grows to a great age, whereas on the mainland and on the lower Tana river it soon declines and dies.

Lamu Town.—(Pop. 7,000. P. T. O. Telephone. Connected with Mombasa by land wire. Telephone to Witu.) Lamu is the administrative centre of the province of Tanaland, and the residence of the provincial commissioner and other officials. It is situated on a slight eminence overlooking the channel between Lamu Island and Manda Island, about 3 miles up the channel from Lamu Bay. It is the headquarters of the Arab civilization on this coast. The population comprises Arabs, Swahilis of mixed Persian and Arab descent, Somali, Galla, and Indian traders.

The town is a labyrinth of narrow streets, with just room enough for two men to pass, between tall stone houses built of coral rock, constructed after the Arab fashion round a central courtyard. Many of them have beautiful doors handsomely carved, but the Arab architecture is poor compared with that found in other countries. At Lamu there are the ruins of a building, said to be a Persian monastery, with a very fine doorway. There are many stone mosques, flat-roofed and inconspicuous ; the minarets are merely low conical towers. The principal building is an old fort, built by the Portuguese, now used as barracks and prison.

The climate is dry and healthy. There are few mosquitoes ; a little leprosy. The soil is sandy and porous, and an invigorating breeze blows off the sea. There is no sanitation ; all refuse is thrown into the street. The water, which is not saline as on the other islands of Archipelago, is drawn from wells.

Lamu was formerly a great centre of the slave trade. It is now difficult to obtain labour.

China and pottery used to be manufactured, but are now scarce. There is much poverty, the former trade being now mostly diverted to Mombasa. The principal exports are mangrove bark, rubber, hides, ivory, sesame, and mat bags.

Fish is good and cheap; ambergris is washed up on the seaward beach of the island in May and June.

Bullocks, sheep, poultry, vegetables, and fruit are abundant.

Lamu Harbour.—The harbour in the channel between Lamu and Manda Islands. It is long and narrow, and encumbered with shoals. The little town of Shella lies at the entrance from Lamu Bay; its only stone building a mosque and a sandhill is encroaching on it from the south. The least depth on the bar is 18 ft.; at about 6 cables within, the depth increases to 35–43 ft.; opposite Lamu town it is 24 ft. The harbour frontage of the town is about $\frac{2}{3}$ of a mile. There is a pier with no steps, but merely iron rings between two uprights; a dhow-building yard is situated at the southern end of the town. A steam launch and iron lighter are available. Steamers of the British India Company call monthly.

There is a local service of steamers from Mombasa to Lamu, and thence to Kismayu, calling at Malindi and Kilifi.

Manda Bay

Situated between Patta Island to the north-east, and Manda Island to south-west is Manda Bay.

It is a fine sheltered capacious harbour, available for all classes of vessels, with deep water in the approach. The least depth at entrance is $5\frac{3}{4}$ fathoms; anchorage in 6 fathoms. The best anchorage is off Kilindini Creek, where there is good landing.

Manda Bay is connected with Lamu Harbour by the tortuous passage of Mlango Mkanda, separating Manda Island from the mainland. At low tide the channel is a mass of mud, and a wall of mangrove rises straight up out of the water on either side.

At the east end of Mlango Mkanda, the mainland shore curves round to the north.

Manda Bay extends northwards with the mainland on the west, and Patta Island on the east. The great mangrove-lined creek of Mongoni opens out of it to the north, and runs up many miles into the land.

Manda Bay connects to the north-east with the Siyu channel, separating Patta Island from the mainland.

Siyu or Siu

(Pop, 5,000.)

The largest town in Patta Island, on the northern side of which it is situated.

It lies at the head of a narrow creek leading out of the Siyu channel, which separates Patta Island from the mainland to the north. The Siyu channel communicates with Manda Bay to the south-west, and Kwyhu Bay to the north-east, and has a general depth of 3 fathoms. Boats and small dhows can come up the creek to Siyu at high tide.

The town consists mainly of mud makuti-roofed huts. Most of the old stone buildings have fallen into ruins.

There is a mosque in a dilapidated condition.

To the west of the town are the remains of a castellated Arab fort of fairly recent date, reached by a long low wooded bridge across the creek. Part of the fort has been restored, to form lodgings for officials visiting the town.

Beyond the fort are ruins and many wells said to have been sunk by the Portuguese. The water is slightly brackish.

Many graves and mausoleums are scattered about the outskirts of the town.

The inhabitants claim to be of Persian descent, but Arab blood probably predominates.

A large area to the south of the town is under coco-nut cultivation.

Patta Island is the largest member of the Lamu archipelago. It is 14 miles long ENE. and WSW. by $4\frac{1}{2}$ to 6 miles wide ; altitude 50 ft. above sea-level. It is composed of coral

formation, with a subsoil of white clayey loam, and an upper stratum of grey loam. It is nearly surrounded by mangroves. The total population is 13,000.

Faza or Paza

Faza is situated on the northern side of Patta Island, about 4 miles north-east of Siyu. It lies up a creek densely fringed with mangroves, which leads out of the eastern end of the Siyu channel. The town is on the west side of the creek, which curves round it. It is so girdled with mangrove swamps as to be practically an island at high water. The creek is tidal and navigable by dhows.

The town consists of makuti huts with a few stone buildings. The only stone buildings of any size are the government house, the Wali's house, and the mosque, all built of coral stone.

Population of mixed Arab, Somali, and Portuguese blood, with perhaps a few Indians. The people are industrious and hard working; nearly all the local traffic of neighbouring ports and the lower Tana is in the hands of the people of Faza. Boats known as 'mtepe', locally called 'idau', are built here. They have a long projecting stern and long graceful prow, and square sails made of matting; the whole boat is fastened together with wooden pegs, and the boards warped close against one another with coco-nut fibre. They are fast and steady craft, and can stand any amount of bad weather and hard usage.

There is an export trade in thatching poles or borities cut from mangrove trees. Faza has a considerable trade with the ports of Tanganyika Territory, Zanzibar, and Mozambique.

The country round Faza is flat; large coco-nut plantations lie south of the town.

Kiunga

Kiunga is a small government station with police garrison, situated on an open sandy beach, $7\frac{1}{2}$ miles south-west of Ras Kiamboni or Dick's Head, which marks the boundary of Jubaland on the coast.

Kiungamini, literally the island of Kiunga, $1\frac{1}{2}$ miles in length, stretches in front of the town, and forms a sheltered anchorage for dhows. The houses are thatched with makuti imported from Faza. The population is of Bajun or Watiku race, with some Arabs.

There is a trade with the Somali in cattle and goats, and cowrie shells gathered from the sea form an article of export. Huge decomposed heaps of these shells attract innumerable flies.

The climate is healthy ; the rainfall is heavier than at Lamu, but the ground is drier and absorbs water more quickly. The water from wells in the town is slightly brackish ; better water is got from a small pond or swamp to west of town. North of Kiunga the mangrove ceases on the coast, except for occasional patches.

Port Durnford or Birikau River

Port Durnford is the estuary of two rivers, the Birikau and Kimoti. Kiembo Point is on the north-east side of the entrance, which is $2\frac{1}{2}$ miles wide, reduced to about 1 cable in navigable width by shoals on either side. The estuary extends for $5\frac{1}{2}$ miles, first almost due north from the sea, then bending round to west, and bifurcating at the mouths of the Birikau and Kimoti rivers, the former to south, the latter to north. The Birikau river has been ascended for about 20 miles by a steam cutter during the dry season, and is navigable at any time for that distance by vessels drawing up to 4 ft. No villages.

The depth at the entrance to Port Durnford is $3\frac{1}{4}$ to 4 fathoms. Close inside is a patch of 3 fathoms in mid-channel. The channel deepens after this to 6 and 7 fathoms, and then to 9.

Port Durnford provides a natural harbour for the fertile district of Joreh, but at present its trade is undeveloped.

The neighbouring country seems to be capable of the highest cultivation, the soil varying from light red to dark fine earth. The river banks are of coral fringed with mangrove, beyond

which is thick bush. Much wild vine rubber could be obtained, but the Somali will not gather it, and will not allow the coast tribes to collect it.

There was formerly a Government station here, but this is now closed. The buildings still remain, in charge of a few police. A small fishing village, Birikau or Burkau, lies on the western shore about 2 miles above the entrance. Pop. 120, consisting of the Watiku tribe.

Communication with Lamu by runner in 4 days, and with Kismayu in 3 days ; also by occasional dhows.

Port Johnes

This harbour is situated about 4 miles north-east of Port Durnford, or Birikau river, on the northern side of Ras Burgal peninsula, which projects from the coast at the north-eastern side of the entrance to Port Durnford and curves round to the north east. The port is entered between the islets off north-eastern end of Ras Burgal and Tandraa Island.

It is a commodious harbour for coasting craft ; the depth at the entrance is $2\frac{1}{2}$ fathoms, decreasing to 2 fathoms inside. The anchorage within, about 1 cable in extent, has a depth of 5 fathoms.

Burgal shoal, of coral, lying about 1 mile east of Ras Burgal, in the approach to Port Johnes from southward, has a least depth of 2 fathoms over it.

The mainland at the back of the port is thickly wooded.

Arnoleh or Anole Creek or Port Tula

Anole lies 13 miles north-east of Port Durnford ; it extends for some 20 miles inland and is navigable by dhows. The depth at entrance is 4 to 10 fathoms, decreasing suddenly to $3\frac{1}{2}$. Anchorage in 3 fathoms, over gravel and sand. The tides are very strong.

Dhows go to the village on the west side of Tula Island for water on their way northwards during south-west monsoons.

Port Shamba

This lies 10 miles north-east of the Arnoleh Creek, and is formed by Tovai or Tuala Island which lies nearly 3 miles from the mainland off the entrance to the Tovai or Shamba river, and is entered on either side of Zigadi Island, which lies in the entrance. The passage on the north-east side is the most direct, but shallow (depth $1\frac{1}{2}$ fathoms); the sea breaks right across with even a moderate swell. The passage on the south-west side has a 3 fathoms bank in mid-channel with depths of 6 to 7 fathoms on either side. Anchorage within is 4 fathoms.

The Tovai or Shamba river is approached from the port over a bar nearly dry at low water, but the river is deep within.

Tovai or Tuala Island is about 5 miles long parallel to coast. It is high, with barren sandhills. A white house stands about $1\frac{1}{2}$ mile from the north end of the island.

Port Thenina

This lies within Thenina Island, immediately north-east of Tovai or Port Shamba. It appears to be a harbour of considerable capacity. No information is available as to its approaches.

Port Kwayama

This lies about 10 miles north-east of Port Shamba. It is approached by a passage on either side of Kwayama Island.

That to the south has depths of 4 to 6 fathoms, on either side of a mid-channel patch of $2\frac{1}{2}$ fathoms. The anchorage is a spacious bay with depths of 4 to 5 fathoms, south-west of Kwayama Island.

Kwayama or 'Upper' Island is the northernmost of the Bajun (Juba or Dundas) Islands, 3 miles long, and wider than most of them. A village stands on its north-west side, and a single white house on east side. The eastern side is skirted by a reef.

Kismayu

Pop. 4,000. Herti Somalis, Arabs, Bajuns, and a few Indian traders. P. O. Telegraph line to Gobwen and Yonti and Italian station of Gumbo. Wireless station connecting with Mombasa.

Kismayu is the principal town and seat of government of the province of Jubaland. It contains the residence of the provisional commissioner, district commissioner, and assistant district commissioner, also a medical officer and inspector of Jubaland police. Kismayu was formerly a military station; Yonte is now the military head-quarters of the province. At Yonte and Gobwen are 4 companies of K.A.R.

The 10 miles radius round Kismayu is leased from Sultan of Zanzibar.

The town is situated on the north-east side of Kismayu or Refuge Bay, 9 miles south-west from the mouth of the Juba, in lat. $0^{\circ} 24' S.$, long. $42^{\circ} 32' E.$

Nine miles SSW. of Gobwen (P. O.), which is 2 miles from mouth of Juba. Yonte is 12 miles up the river from Gobwen, and has several European houses.

Description of town.—The town consists of a cluster of white houses and native huts lying among sand dunes.

The stone houses, which serve as residences for the Government officials and Indian traders, are built of coral rock, with flat roofs, 2 storeys, and balcony, to which access is obtained by a broad wooden staircase.

The native huts have only single room, and are constructed entirely of makuti, i.e. palm fibre interwoven with reeds and branches; they have no window; the doors are low and narrow; the interior is dark and cool, and eminently suited to the climate. The native huts are arranged in straight lines on each side of broad sandy streets, which nearly all lead to a central square in which are situated the fort, court house, gaol, and provisional commissioner's office; also a small hall with open sides where all important meetings between the commissioner and the Somali chiefs are held.

The fort, now the treasury, is of Arab construction. When Kismayu was a military station the officers' quarters were round it. The high thick wall which surrounded them is still standing and in excellent repair.

There is a club at Kismayu, but no hotel or inn.

Kismayu is a convict settlement, to which the commissioners of the various provinces have power to deport dangerous persons. Mwanga, king of Uganda, was sent here, and afterwards to the Seychelles Islands.

There is little cultivation round Kismayu ; the land is undulating, with no conspicuous land-marks. The shores of Kismayu Bay are dotted with mimosa and scrub and a few palm trees.

Water supply.—There are several wells at Kismayu ; the water is bitter and unpleasant. Water is fetched from the Juba river, 9 miles to north-east, in 12-gallon tanks on camels. At the only place where it is possible to fill tanks, the refuse of the little town of Gobwen is swept into river. Dysentery is in consequence rife in Kismayu. The annual rainfall is 11 inches.

Roads.—Wagon-road from Kismayu to Churre Moyale on Abyssinian frontier via Afmadu and Wajheir. The roads in the European quarter of the town are made of crushed coral rock and sea shells pounded hard by convicts. The final appearance of such a road resembles that of white chalk which, combined with sea, sand, and whitewashed houses, produces terrible glare.

Trade, supplies, &c.—Trade is mainly in the hands of Indians, mostly Khojas from Bombay. They do much business with the Herti Somalis, but never venture into the interior.

The chief exports are hides, maize, cotton, and ivory.

The imports include manufactured articles, especially cotton cloth of all descriptions. These goods are principally made in America and India ; very few British-made articles are imported. There is also a certain import of coffee. Ox skins are sent from Afmadu district to Kismayu for shipment.

There is a fair trade in cattle ; this is in the hands of Somali and Arabs, who export the beasts to Zanzibar, and thence drive them overland to Nairobi, a long and arduous march. They consider themselves lucky if they arrive at Nairobi with 75 per cent. of their beasts. The Government discourages this trekking on account of friction with the tribes on the route. Caravans of camels go from Kismayu to Abyssinia via Wajheir and Eil Wak. From these caravans, as they return, the Somali obtain modern rifles and ammunition.

The Somali buy cloth, sugar, and buni at Kismayu. Buni is made of the husks of coffee berries, roasted in ghee, and sweetened with sugar.

The Somali are increasing in number, and so are their flocks and herds. Except along the banks of the Juba, the country could never be agricultural for lack of rain ; but if roads were made trade would develop, especially if a light railway were built to the Abyssinian frontier via Afmadu.

N.B.—The Herti Somalis are situated round Kismayu. Number about 3,000. The other neighbouring division of the race, the Ogadein Somalis, are wilder and more nomadic.

The alluvial country along the banks of the lower Juba is very rich, including some half million acres of rich irrigable land, which the Juba floods twice a year. European plantations here are irrigated by centrifugal pumps driven by oil engines. Maize (largely exported to Italian Somaliland), corn, and cotton are produced. Most European vegetables do well, also citrus trees. There is a large traffic in corn with Kismayu. Transport is very cheap and little handling is required. Cotton grown on the banks of Juba is rolled in bales from the ginnery into barges, which are taken in tow by steamers, and brought into Kismayu harbour in two hours for shipment.

The land along the Juba river is suitable for sugar cultivation.

The Emperor Navigation Company has two river steamers on the Juba, each capable of towing 2 forty-ton barges. There is also a Government steam launch capable of towing 1 barge. The Italians, who administer the east bank of the Juba, have

a river steamer and a small ocean-going steamer which trades between Gobwen and Kismayu. Arabs with camel transport compete with the steamers.

Beef and mutton are plentiful at Kismayu ; vegetables are scarce. Fish may be obtained with the seine on the beach.

Kismayu Harbour.—The harbour is contained between Blanket Point to the south-west, and a point off which is Kismayu Island to the north-east, a distance of about 6 miles. A few small islands and isolated coral reefs stretch in front of the bay, and form a natural breakwater.

Kismayu affords a well-protected roadstead accessible at all seasons, better than anything north of Manda Bay or on the coast of Italian Somaliland. At Mogdishu, for instance, it is only possible to land in small boats on an exposed shore. The entrance to the harbour is difficult and intricate, demanding careful navigation ; the passage winds in and out between coral reefs.

The outermost reef, known as Owen Reef, is $2\frac{1}{2}$ miles from the entrance to the bay ; it consists of a narrow coral chain parallel to the shore.

There are four principal passes into the harbour, viz., Fawn, Knott, Zigzag, and North Channel, from south-west to north-east. The first-named is best for vessels from the south, the last for those from the north. Fawn Pass has a depth of 5 fathoms ; North Channel from 10 to 14 fathoms ; Zigzag Pass is the great natural entrance, but cannot be used owing to the absence of leading marks.

There is anchorage off the town in $3\frac{1}{2}$ fathoms, sand and mud.

Islets off bay.—Mtanga Ya Papa, $1\frac{1}{2}$ mile north-east of Blanket Point, 45 ft. high, covered with scrub. Green Islet, 2 cables north-west of last, 25 ft. high. Nyuni Island, $1\frac{1}{2}$ mile south of Mtanga Ya Papa, 25 ft. high, dome-shaped. Fawatu Island, 3 miles north-east of Mtanga Ya Papa, 13 ft. high, marked by white pillar. Pillar Rock, on which is a cairn 48 ft. high, situated on the shore reef on the north-west side of the bay. Kismayu Island, 85 ft. high, low scrub. Mear Tomb,

2 miles north-east of Kismayu Island, 40 ft. high, with dip in centre, very green after rain.

Steamers anchor $1\frac{1}{2}$ mile from the town. Landing is done by means of a steam tender and boats. An iron lattice-girder pier, 325 ft. in length, extends from the shore near the customs house, $\frac{1}{2}$ mile south-west of Kismayu Fort, with which it is connected by a trolley line. A derrick at its outer end has a capacity of about $\frac{1}{2}$ ton.

The slope of the beach is so slight that boats cannot be brought within 15 yds. of shore.

Steamers of the Italian East Africa Line call regularly at Kismayu, going and coming, on their monthly run between Genoa and Kilindini via Naples, Alexandria, Port Said, and Mogdishu.

Two small steamers belonging to rival Indian firms run from Mombasa to Kismayu, covering the 364 miles between the two ports in 3 to 5 days, and calling at Kilifi, Malindi, and Lamu.

As the mouth of the river Juba is blocked by a bar which no ocean-going steamer can cross, stores are landed at Kismayu or transhipped to a local steamer, plying between Kismayu, Gobwen, and Yonti, which can only cross the bar at certain times (depth on bar about $1\frac{1}{2}$ ft. at low water). When the river cannot be navigated, supplies are taken overland.

Owing to the Juba bar, goods can only reach Jumbo (administrative capital of Italian Somaliland) by being transhipped at Kismayu.

PART II

INLAND TOWNS AND SETTLEMENTS

Nairobi

5,450 ft. above sea-level, 327 miles from the coast.

Nairobi is the administrative centre and capital of British East Africa; head-quarters of the chief Government departments; and chief town of Ukamba province.

G. P. O., T. O., telephone. The erection of an imperial wireless station appears to be contemplated.

Pop. about 19,000, of which 2,000 are Europeans and 5,000 Asiatics.

Description.—The town is built at the extremity of a grassy plain, with foothills rising gradually to north and north-west towards Limoru and Kikuyu. The European commercial area occupies the south central district, and will be extended northward when the swampy ground along the Nairobi river has been drained. The Indian bazaar, covering 9 acres, is in a central position ; its removal beyond the river is strongly urged by the sanitary authorities (see below, p. 302). The European residential area consists of the two suburbs of Parklands to north-west and Nairobi hill to west and south-west of the town. The better-class Asiatic residential area lies to north-east of the town, merging to south into that of the poorer Asiatics (petty traders and workmen), while south of this again is the African area, through which the Thika branch railway runs.

The main thoroughfares are Government Road, leading from the railway station, at the south-east corner of the town, and Sixth Avenue, running at right angles from Government Road across the railway to Nairobi hill. In these roads are situated the principal hotels and most of the offices and shops. Many of the handsome new Government offices, which are replacing the former shanties of galvanized iron, are being built along Sixth Avenue, which already contains some fine buildings.

Metalled roads and masonry drains are in process of construction.

Government buildings and institutions.—Government house, with grounds, on Nairobi Hill ; head offices of the following departments: land, survey, agriculture, forestry, military, Uganda Railway (with large workshops at the station), treasury, principal registry of documents (transferred from Mombasa) ; high court, town magistrate's court ; head-quarters and central training dépôt of the East African police ; district commissioner's office ; first-class prison ; reformatory for

boys ; European hospital, native hospital ; lunatic asylum ; quarantine station and isolation hospitals (to south of the race course) ; ' A ' school (for boys and girls between 8 and 14) ; Indian school (with average attendance of 146 in 1915) ; bacteriological laboratory. There is an arboretum under the forestry department, and a Government experimental farm at Kabete, about 9 miles outside the town.

Other buildings and institutions :

Hotels. New Stanley (in Sixth Avenue) ; Norfolk and Grand (both in Government Road) ; Victoria (in Victoria Street) ; Metropole (in Racecourse Road) ; Carlton Lounge.

Banks. Branches of the National Bank of India, Ltd. ; Standard Bank of South Africa ; and National Bank of South Africa.

Churches. Anglican, Roman Catholic, Presbyterian.

Mission schools. C.M.S. boys' school, night school, and women's school ; Roman Catholic Missions : (French) Mission of the Holy Ghost (with attendance of about 157 Eurasians and Goans in 1915) ; St. Joseph's Convent (white children).

Synagogue. Masonic temple.

Clubs. Muthaiga County Club, European, Nairobi, Parklands, East African Turf ; golf, polo, cricket, tennis, football. (The polo ground is near the waterworks to south-west of the town, the race course to east of the town.) Y.M.C.A., Y.W.C.A.

Associations. Chamber of Commerce, Colonists' Association, Landowners' Association.

Markets. Grain store and market, general market and native market, all in the Asiatic quarter.

Newspapers. *East African Standard*, *Leader* (both of these daily and weekly).

Miscellaneous. Scott Sanatorium, one or two private nursing homes ; two theatres ; motor garages ; several good boarding-houses ; Nairobi house, offices, and estate agency, largest block of buildings in the town ; steam laundry ; ice factory. Good shops—Nairobi is the usual starting-point for *safaris* (hunting trips), and several firms specialize in fitting these out.

Outside the town, on the south side, are the cantonments of the King's African Rifles (3rd battalion) ; the cemetery ; a rifle range ; a municipal reserve (containing the police lines) ; and the municipal stock sale yard. There is a public park between the railway and Nairobi hill, and a municipal forest reserve, for supplying fuel to the town.

Jinrickshaws, drawn by natives, take the place of cabs.

Administration.—The town government is in the hands of a municipal council, composed of the heads of government departments and elected representatives of the people ; women have a municipal vote. An ordinance of 1917, the ' Nairobi Township Rules ', laid down regulations on such subjects as markets, stockyards, the native location, lodging houses, foodshops, vehicles, jinrickshaw districts, lighting, suppression of mosquitoes, sanitation, notification of infectious diseases, and preservation of public order.

Health conditions (climate, water supply, sanitation).—The climate of Nairobi is pleasant, the average temperature being about 66° Fahr. in the cool season, and 73° Fahr. in the hot season, and the average annual rainfall 36·41 in. The wettest months are from March to May and October to December. The water supply is in its origin excellent and abundant, coming in pipes from springs near Kikuyu, but these springs and the reservoirs need protection from outside contamination, which is not at present thoroughly assured. The water supply is under the control of the railway department. There are septic tanks and a purifying filter in the north part of the African area. The name Nairobi, *engare e rob*i in the Masai language, means ' cold water '.

Sanitary conditions have, unfortunately, left much to be desired. The rapid and haphazard growth of the town, lack of funds, and of a sufficient sanitary staff, and the presence of the overcrowded and filthy Indian bazaar, have all contributed to this result. A new drainage scheme was inaugurated in 1908, but owing to lack of funds, was reported to be only in its early stages in 1913 ; it is still in progress. The Indian bazaar has been repeatedly proved a centre for the

dissemination of plague, which was first introduced by the Asiatics.

The need for an enlarged sanitary organization has now been met by the appointment of a medical officer and European inspectors, and vigorous anti-plague and anti-malaria measures are being taken. Draining of the river swamps should do much to check the latter. The native Africans are much cleaner in their dwellings and habits than the Asiatics.

During the war Nairobi has been practically the base as well as the head-quarters of the military forces in the colony. Several military hospitals were started, some for European officers, others for Indian soldiers.

Dagoreti

About 3 miles from Kikuyu station.

Government administrative station and police post. It was formerly of some importance in native affairs, but has now been largely superseded by the newly-opened station near Ngong.

Dagoreti is one of the townships to which the Townships (Sanitary) Rules of 1917 apply. It has a forest nursery.

Elburgon

Situated in front of Mau at altitude of 7,941 ft., near the head waters of the Ngara Rongei, at mile 474 on the Uganda Railway.

There was formerly nothing at Elburgon but the railway station, at which water and fuel could be obtained for engines.

Such population as there is now consists mainly of people engaged in the various saw-mills.

Eldama Ravine

This settlement, popularly known as Ravine, is situated in Naivasha province, about 22 miles from Londiani Railway station. It has P. and T. O., and British postal orders are issued and paid. Runner mail twice a week to and from Londiani.

Ravine is a Government station, with district commissioner, medical officer (Indian sub-assistant surgeon), and police station. It is one of the townships to which the Townships (Sanitary) Rules of 1917 apply. The climate is good. Average annual rainfall, 43·09 in. The population consists of only about half-a-dozen Europeans in the actual township, and about 20 more on farms and saw-mills near; a few Indian traders. Census of 18 adult Asiatics (1911). It is the administrative centre for the adjoining native reserve; and was an important transport centre before the railway came.

Eldoret

Central township for the Uasin Gishu plateau, on the Eldore river. It has P. and T. O. (British postal orders issued and paid), and is a leading trade-centre, with good hotel and several good stores. It dates from 1910. Eldoret is one of the townships to which the Townships (Sanitary) Rules of 1917 apply, and will be a station on the Nakuru-Mumias railway when this is constructed. There is a resident town magistrate.

Buildings and institutions.—Branch of Standard Bank of South Africa; Central Government School (for boarders), opened in 1915, with 44 pupils in 1916; dispensary; prison; flax mills; creamery.

Population.—The present white population, including a colony of Boer settlers, probably amounts to about 1,000. There are not more than about 100 Indians.

Good bricks are made in the neighbourhood; stone is plentiful, and timber cheap. Fuel is supplied from a forest area of about 100 acres, about 20 miles away, and demarcated for the purpose.

A road runs to Londiani (q.v.).

Embu

South of Mount Kenya, in Kenya province.

P. and T. O. Bi-weekly mail service with Fort Hall.

Administrative station for native affairs; residence of assistant district commissioner; police post; prison.

Embu is one of the townships to which the Townships (Sanitary) Rules of 1917 apply. The population consists of a mere handful of Europeans (officials and missionaries) and Indian traders. In 1911 there were 16 adult Asiatics.

Escarpment

Alt. 7,390 ft. Station on Uganda Railway. P. and T. O. Indian stationmaster and telegraphist.

There are no Europeans resident near the station, though they work in connexion with saw-mills in the forest district. There are about 20 to 30 Indian small traders.

Fort Hall

Alt. 4,500 ft. above sea-level ; in Kenya province.

P. and T. O. British postal orders are issued and paid. Bi-weekly mail to Embu.

Fort Hall is a Government station ; residence of district commissioner, assistant district commissioner, medical officer, assistant police superintendent. It is the trading centre for an agricultural district (maize, &c.) ; fine shooting. No hotel. Second class prison. There are several Indian store-keepers. In 1911 there were 44 adult Asiatics.

Fort Hall is one of the townships to which the Townships (Sanitary) Rules of 1917 apply. Relaxing climate ; its average annual rainfall is 47.52 in. ; the sanitation has lately been improved. The station covers 1,000 acres, which have to be kept free of tall vegetation. The water-supply is satisfactory.

Roads run to Embu (33 miles), Chuka (71 miles), and Meru (122 miles) ; a motor road to Nairobi and Nyeri.

Kapsabet

See Nandi.

Kericho

Situated between the Lumbwa and Sotik country, about 20 miles south-west of Lumbwa station. Alt. about 6,500 ft. above sea-level.

306 HARBOURS ; TOWNSHIPS ; SETTLEMENTS

P. and T. O. ; Head-quarters of District Commissioner ; centre of a certain number of European settlements.

Kiambu

About 8 miles due north of Nairobi.

P. and T. O. British postal orders are issued and paid. There is a runner mail daily from Nairobi.

Kiambu contains the residence of a district commissioner and assistant district commissioner ; police station, with European assistant police superintendent, and an Indian sub-assistant surgeon. No hotel. Native tribunal. Prison. Church. Stores.

It is one of the townships to which the Townships (Sanitary) Rules of 1917 apply.

The population includes probably about 12 Europeans and 50 Indians. The 1911 census gave 62 Asiatics.

Kiambu lies in the premier coffee-growing district and the most closely settled European planting district.

There is a fairly good motor road to Nairobi.

Kikuyu

6,700 ft. above sea-level ; in Ukamba province. Station on Uganda railway.

P. and T. O. Police station near railway station.

Transport centre ; centre for native grain trade ; Kikuyu Trading Syndicate.

There is a Roman Catholic and a Church of Scotland mission station. Cultivations of vegetables, maize, millet.

Average annual rainfall, 47·69 in. Water supply from the Kiboko swamp, pumped up 600 ft., yielding 20,000 gallons a day.

Kikuyu Station adjoins a reserve for the tribe of that name, and there are a number of rough shanties inhabited by Indian traders who buy native produce in exchange for cloth and beads.

Kijabe

Kijabe lies 6,790 ft. above sea-level, half-way down between the summit of the escarpment and the floor of the Rift valley. It is a station on the Uganda railway.

P. and T. O. (British postal orders issued and paid).

A starting point for the southern Masai reserve transport service.

The name Kijabe means 'wind'. About 3 miles away is the Kijabe Hill health resort, 7,300 ft., where the Africa Inland Mission Station have their head-quarters and a school.

Kisii (Boma)

Situated below south-west end of Manga escarpment of Kisii highlands in Nyanza province, near river Riana.

P. O. ; residence of district commissioners ; head-quarters of Kisii district. Detachment of native police, with barracks.

In 1915 it was the site of a hospital and sleeping-sickness camp with medical officer in charge.

It has a roofed-in market ; shops of Indian traders ; and bungalows of red brick, manufactured locally.

Millet, vegetables, and bananas are grown in the neighbourhood.

Roads run to Kendu, on the southern shore of Kavirondo Gulf (being improved in 1913) ; to Homa Bay (27 miles), also on southern shore of Kavirondo Gulf, along which there is much bullock transport ; and to the Kisii highlands above.

Kitui

In the Kitui district of Ukamba province, rather over 30 miles north of Machakos.

P. and T. O. Prison.

Administrative station for native affairs, with resident district commissioner. There is a fairly large trade (probably in beeswax, grain, and cattle), and many Indians are engaged in buying and selling with natives. There are only a very few Europeans.

308 HARBOURS ; TOWNSHIPS ; SETTLEMENTS

The site is rather unhealthy. Average yearly rainfall, 39·14 in.

This is one of the townships to which the Townships (Sanitary) Rules of 1917 apply.

Limoru

Station on the Uganda railway, between Kikuyu and escarpment, alt. 7,340 ft.

P. and T. O. British postal orders are issued and paid.

Limoru is a flourishing European settlement engaged in wattle, coffee, and maize production. There is no actual township as yet, except at the railway station, where there is a European store (containing the P. O.), a timber dépôt, and about 20 Indian shanties. On the south side of the railway is a native reserve.

There is a local unit of the King's African Rifles, with a rifle range.

It is a forest and agricultural district, with saw-mills and flour-mills.

Londiani

Alt. 7,410 ft. above sea-level, in Naivasha province. It is a station on the Uganda railway, 51 miles from Nakuru.

P. and T. O. British postal orders are issued and paid. A runner mail goes twice weekly to and from Eldama ravine ; post-cart service, carrying passengers to Eldoret (in 20 hours).

There is a good hotel ; several European stores, stockyards, where sales are held, and European police station ; also a forest nursery and saw mills. Census of 18 adult Asiatics (1911).

Londiani is the starting-point for transport service (mainly in hands of Boer settlers) to the Uasin Gishu plateau.

It is connected by a bad road, boggy in rains, with Eldoret (67 miles) ; this road is always under repair.

Lumbwa

Station on the Uganda railway, on Nyando river. Alt. about 6,000 ft. above sea-level.

P. and T. O.

Mild climate. Average annual rainfall 42·5 in.

Timber is abundant ; there is a dairying industry, with co-operative creamery ; stock-raising and bacon industry ; flax-growing ; and a flax fibre factory.

Lumbwa is a centre of European settlement, with a European police officer. It may be regarded as a sanatorium for the low country round Lake Victoria. At one time there was a rest house here for this purpose. This has now been made into the railway dak bungalow, which serves the same purpose.

Machakos

Head-quarters of Ulu district in Ukamba province.

P. and T. O. A runner mail goes to Kapiti (4 days a week). Machakos is between 20 and 30 miles from the railway (Kapiti plains and Stony Athi stations).

It is one of the oldest European settlements in up-country East Africa. Before the railway came, Machakos was an important transport station for the far interior. It is now the centre of a cattle, fruit, and wheat-farming district, the former ostrich-farming industry having declined.

There are two European stores, Indian shops, native industrial school, and prison. It is one of the townships to which the Townships (Sanitary) Rules of 1917 apply. The site is healthy, with an average annual rainfall of 37·65 in. There is good lion shooting in the neighbourhood. The probable population of the actual township is 10 Europeans and about 100 Asiatics (in 1911 there were 140 adult Asiatics).

Meru

In Kenya province, to north of Mount Kenya.

P. and T. O. Prison. Two mills. Meru is a transport station for traffic with the northern frontier district (Marsabit, &c.). It has a growing trade in goats and skins with the Boran and Somali of the Lorian region. Census of 1911 gave 16 adult Asiatics at Meru.

310 HARBOURS ; TOWNSHIPS ; SETTLEMENTS

It lies in a healthy situation, and is one of the townships to which the Townships (Sanitary) Rules of 1917 apply.

A road to Nyeri was in process of construction in 1914.

Mumias

Mumias lies on the low ridge between the valley of the Lusumu and the Nzoia, and is on the road between Mbale (Uganda) and Kisumu.

It is the residence of a district commissioner.

P. and T. O. There is a runner mail with Kisumu (twice weekly).

The population is not over 600, all told ; there were 85 Asiatics in 1911.

There is a poor Indian bazar and a prison.

Mumias is notoriously unhealthy both for Europeans and natives. There is much fever, and the rainfall is very heavy (averaging 71·76 in. in the year) ; the conformation of the ground renders the draining of the swampy soil impossible. A removal of the station to Elumino ridge, about 13 miles to south, has been recommended. If such removal took place, the projected railway to Mumias would require reconsideration.

Naivasha

Alt. 6,290 ft. above sea-level ; on the eastern shore of the lake of the same name, at the foot of the Aberdare range. Government station ; head-quarters of Naivasha province. Residence of province and district commissioners. Station on the Uganda railway.

P. and T. O. (British postal orders issued and paid).

Rift valley hotel (and tea-room) ; Naivasha hotel ; good store ; a few Indian shops ; butchery and bakery ; prison (2nd class).

Naivasha is the centre of a sheep-farming district ; important sales of cattle are held at the stock yards ; and a government experimental stock and dairy farm is situated at Morendat, 5 miles away. Public works department ; East African police. Golf course.

The site is healthy ; average annual rainfall 25·75 in. Naivasha is one of the townships to which the Townships (Sanitary) Rules of 1917 apply.

Naivasha is now more important as a health station than as a commercial centre. Nakuru has been superseding it, and may be destined to become the head-quarters of the province in its place.

Nakuru

Alt. 5,950 ft. above sea-level ; centre of a sub-district of Naivasha province ; on the shores of a salt lake, surrounded by extinct volcanoes and other mountains. Station on Uganda railway. P. and T. O. (British postal orders issued and paid).

Hotel ; several good stores ; club.

Resident town magistrate, medical officer, veterinary officer ; assistant traffic manager of railway.

Nakuru is the proposed junction for the Uasin Gishu railway, and is the best up-country European shopping centre after Nairobi and the market town for the districts of which it is the centre, viz. Molo river valley (maize-growing), Naivasha and Gilgil (sheep and cattle), and the country to north-west. It is a town of growing importance, and is already the chief centre for agricultural settlers in the Rift valley and head-quarters of the Pastoralists' Association and of the British East Africa Maizegrowers' Association. An annual agricultural show is held about Christmas, and a government model cattle-dipping tank is installed here.

The town possesses a government 'A' school, engineering shop and garage, town magistrate's court, prison, branch of National Bank of India, masonic lodge, turf club (two race-meetings a year). There is good game country in the neighbourhood.

Average annual rainfall, 33·72 in. New water-supply installed in March 1915 ; service reservoir completed ; the distribution system is left in charge of the railway authorities. Nakuru is one of the townships to which the Townships (Sanitary) Rules of 1917 apply.

Nandi

On a plateau rising from the Kavirondo plain, in Nyanza province. Nandi is really a reserve for the tribe of the same name, with Kapsabet as the head-quarters of the district administration. Kapsabet is 22 miles by road from Kibigori railway station.

P. and T. O. Hospital. Prison. Census of 20 Asiatics (1911).

There is a second government station and police post at Kaptumo, 10 miles nearer the railway.

Ngong

About 12 miles from Nairobi, with which it is connected by road.

Administrative station for the Masai reserve ; residence of district commissioner and assistant district commissioner. A healthy station, bordering on forest reserve. It has a Scotch mission school (experimental).

Nyeri

Alt. 6,000 ft. above sea-level ; on slopes of Mount Kenya ; 37 miles north-west of Fort Hall, 45 from Naivasha. Head-quarters of Kenya province, transferred here from Fort Hall for health reasons.

P. and T. O. Telephone (British postal orders issued and paid). Mail service to Fort Hall and Nairobi (3 days a week), and to Meru (twice a week).

Forest station, with forest nursery. Maize trade ; growing trade in goats and skins with the Boran and Somali on the Lorian. European and Indian stores. Prison.

Nyeri is one of the townships to which the Townships (Sanitary) Rules of 1917 apply. The situation is healthy ; average annual rainfall, 36.66 in.

Road to Meru in process of construction in 1914.

Rabai

In Seyidie province, 3 miles from Mazeras railway station. P. and T. O.

Assistant district commissioner and a few native police. C.M.S. station and school. Prison. Cattle-market.

Rabai is one of the townships to which the Townships (Sanitary) Rules of 1917 apply.

The 1911 census gave 35 adult Asiatics.

Fruit, sugar-cane, and coconuts are cultivated. There is a government experimental agricultural station close to Mazeras station.

Ruiru

Station on the Nairobi-Thika branch railway, about 17 miles from Nairobi, with which it is also connected by motor road, i.e. the Nairobi-Thika-Nyeri road.

P. and T. O. Hotel.

There is a hydro-electric station worked from falls on the Ruiru river, for supplying light and power to Nairobi and district.

Ruiru is a considerable European settlement. In 1911 there were 15 Asiatics.

Taveta

Alt. 2,350 ft. above sea-level. On the old Anglo-German frontier, 75 miles from Voi. Now a railway station on the Voi to Moshi line, which was constructed as far as Unter Kahe, near Moshi, during the campaign against German East Africa.

Administrative station.

The township lies on the Lumi river, in a basin, commanded by an inner semicircle of hills known as Kitowo Hills. It is an unhealthy spot, exceptionally hot; swampy; the tsetse fly infests the forest banks of the river. The Germans suffered from typhoid during their occupation of Taveta, 1915-16; it was recaptured by the British on March 8, 1916.

The Germans are reported to have dug wells here, and laid on water in pipes. The post consisted (1914) of official's house and office (stone), prison (stone), armoury, hospital (stone), several tin and mud huts. Forest to south. Ground all round post reported (1916) to have been cleared. Roads to (a) Kahe, (b) Kikoro.

Thika

Terminus of branch railway from Nairobi (32 miles). Situated at the confluence of the Chania and Thika rivers.

P. and T. O. 'Blue Posts' hotel. A number of the usual corrugated iron shops of Indian traders. Police station with native force under European constable who is in charge of the surrounding district.

Thika is a pleasure resort for Nairobi; both rivers have fine waterfalls, and very fair fishing.

A passable motor road (Nairobi-Thika-Fort Hall-Nyeri).

The climate is slightly warmer than Nairobi.

Resident European population about 20.

Witu

In Tanaland province, 15 miles inland north of the mouth of the Ozi river and the port of Kipini, about 20 miles west of Lamu.

Situated on a low ridge, entirely surrounded by forest.

Witu formerly had a telegraph line to Mombasa and Lamu. There is now only a telephone to Lamu. The line belongs to Sultan of Witu.

It is the chief town of Sultanate of Witu, but has special importance. The Sultan resides in a tin-roofed house; the other houses are merely mud and daub huts.

There is a police station.

The inhabitants are chiefly of the runaway slave type, with some Swahili and Galla.

The water supply is good and abundant, chiefly from old wells; some slightly brackish. The small river to east of the town is dry for 7 months of the year.

There is a trade in salt, procured from a small salt lake to southward.

Plantations of coconuts and pine apples.

Mosquitoes are very troublesome.

PART III

TOWNS AND PORTS ON THE LAKE

Kisumu

Population : about 50 Europeans (government officials, railway staff, officers and engineers of the lake steamers, personnel of commercial community), about 500 Indians (traders and railway personnel), and from 3,000 to 5,000 natives.

P. T. O. Telephone exchange.

Chief town of Nyanza province (pop. 1,116,655—natives 1,144,272, Europeans 431, Asiatics 1,896, and Anglo-Indians 56). Formerly called Port Florence, a name which properly belongs to the harbour only, not to the town. Residence of provincial commissioner.

Situation.—Lat. $0^{\circ} 7' S.$, long. $34^{\circ} 44' E.$: a few miles south of the equator ; at north-east corner of Kavirondo Gulf, which extends 40 miles east from the Victoria Nyanza.

Alt. 3,700 ft. Distance from coast of Indian Ocean in straight line 415 miles ; by railway from Mombasa 584 miles. The train journey takes 43 hrs. Kisumu is the terminal port of the Uganda railway and head-quarters of the marine department.

Description of Town.—The town is built on a saddle-backed hill (basalt), and extends down the slopes of the hill to the lake shore.

The European residences are on the hill. Here are also the post office, the Church of England and Roman Catholic churches, the National Bank of India, hotel, rest house, and club. The main thoroughfares are Connaught Road and Victoria Road.

The Indian bazar is near the railway station, which lies close to harbour. A branch line runs down to pier. Chambers capable of holding 100 tons erected for disinfecting purposes at Kisumu station.

Trade.—The Kavirondo are keen agriculturists and traders ; they produce rubber, coffee, sesame, cotton, and grain.

The granaries and grain market are near the junction of the Yala and Kisumu roads, in a convenient situation for dealing with the grain as it enters the town.

There is a cotton ginnery near the railway station, where cotton is ginned and baled for export.

Much trade from Uganda, Belgian Congo, and the lake ports of Tanganyika Territory passes through Kisumu. The customs house stands inside an enclosure, close to the wharf. The road from Kisumu to Mumias, 48 miles, and thence to Iganga and Jinja carries more wheel traffic than any other in Protectorate ; it is kept in fair order, but is unmetalled.

Climate and health.—The climate is trying to Europeans. Average rainfall 49·12. In 1913 rain fell on 117 days in the year.

Violent thunderstorms are common in the afternoon.

Plague is endemic at Kisumu ; malaria and typhoid are rife. There is no sleeping-sickness.

When there is an outbreak of plague, trains do not stop at the town station, but go straight to the pier.

The scrub and bush have been cleared in the township area, to prevent harbouring of mosquitoes and flies.

Water supply.—Water for the European houses is derived from rain water collected in tanks from the roofs.

For the town generally, it is pumped up from the lake. The intake pipe is at the end of Connaught Road. Water is stored on the hill in a small reservoir, and distributed to the town below. It is not filtered, and never drunk by Europeans, being much contaminated by vegetable matter and the churning up of the mud by steamers.

Water might be derived from the upper reaches of the Kibos river in the Nandi hills.

Harbour and steamers.—Pier, 440 ft. in length, with berth accommodation for 2 steamers, tug, and lighters. Shed on pier 250 ft. by 10.

Wharf 760 ft. in length with berthing accommodation for 3 steamers. Two sheds 250 ft. by 10, and 1 shed 100 ft. by 30. Vessels drawing up to 7 ft. can lie alongside wharf.

Lifting appliances : 1 3-ton steam crane.

1 10-ton breakdown crane available for either pier or wharf.

Customs house inside enclosure close to wharf. Closed at 6.30.

Cold storage installation.

Machine shop 250 ft. by 40 fitted with overhead travelling crane.

Old machine shop converted into smithy and sail-making loft.

Water sterilizing plant on Kisumu pier, also cargo disinfecting chambers for use with 'Clayton Disinfector'.

Commodious dry dock 370 ft. by 42 ft. in depth, over sill 9 ft. 6 in. Served with 1 centrifugal and 2 pulsometer pumps. Lifting appliances—20-ton sheer legs, 5-ton steam travelling crane.

Steamers, belonging to the Uganda Railway, connect with Uganda and Lake ports.

Six passenger steamers and 3 tugs.

The passenger steamers are :

Winifred, 1903, twin screw, 700 tons, 550 h.p., carries 150 tons cargo, 9–10 knots. 10 1st and 8 2nd class passengers.

Sybil, 1904 (as *Winifred*).

Clement Hill, 1906, twin screw, 1,100 tons, 635 h.p., carries 250 tons cargo, 9–10 knots. 20 1st and 12 2nd class passengers.

Nyanza, 1907, twin screw, 1,146 tons, 550 h.p., carries 525 tons cargo, 9 to 10 knots. 3 1st class passengers.

Usoga, 1913, single screw, 1,200 tons, 400 h.p., carries 525 tons cargo, 8 knots. 8 1st class passengers, burns oil.

Rusinga, 1914 (as *Usoga*).

The steam tugs are :

Percy Anderson, 1897, single screw, 100 tons, 120 h.p., 7–8 knots.

Kavirondo, 1913, single screw, 200 tons, 400 h.p., carries 60 tons cargo, 9–10 knots.

Husseni, 1913, single screw, 50 tons, 50 h.p., carries 40 tons cargo, 7 knots, burns wood.

A pile-driving barge was completed in 1915.

318 HARBOURS ; TOWNSHIPS ; SETTLEMENTS

The passenger steamers are fitted with electric light. The passenger cabins have 2 berths each. Good promenade deck covered with double awnings.

The passenger traffic is not large ; a steamer carrying 60 to 100 first and second class passengers, with cabin, saloon, and other accommodation, and practically no space for cargo would not pay working expenses.

Steamers run twice every week by alternate routes.—North via Jinja, and south via Karungu, calling at (following northern route) Usembo (Asembo) Bay, Homa Bay, Jinja, Kampala Port, Entebbe, Bukakata, Bukoba, Mwanza, Shirati, Karungu, Homa Bay, Usembo, Kisumu.

There is a Government schooner.

Homa Bay

Situated on southern shore of Homa Bay, 39 miles in a straight line south-west of Kisumu.

Trading station. Landing-place for cargo, brought by lighters towed by tugs from Kisumu. Entirely inhabited by Indians. Prosperous. Many Indian shops.

Indian customs officer.

There is much traffic between Homa and Kisii (Government station with post office 27 miles WSW.) along cleared road by bullock cart. Eleven miles along the road from Homa Bay is a small settlement of Indian traders at Languh.

There is also traffic between Homa Bay and Karungu (32 miles south-west) along track.

Goods shed, 50 ft. by 20. Earth embankment faced at end with wooden jetty. Depth at end of pier 5 ft.

A little schooner calls regularly every week bringing goods from Kisumu.

Port of call for steamers circumnavigating lake. Landing is done by boats.

Beach muddy, water open, no ambach swamp.

The natives (Kavirondo) are expert fishermen with a seine made of papyrus stems. The fish are driven into large funnel-shaped wicker baskets ranged close together in shallow water.

Homa Bay, in the southern shore of Kavirondo Gulf, recedes south-east about 7 miles, and is $4\frac{1}{2}$ miles across at entrance in north-east and south-west direction. It is surrounded with hills; to north-east is Homa mountain (5,742 ft.), a rugged volcanic bluff, projecting due east, 9 miles west of Oyoma Point, the channel turning south-west between them. The lower slopes of the mountain are cultivated.

On south-west side are the volcanic cones of Ruri and Sahanga.

To south-east of settlement is the volcanic cone of Asego rising from an alluvial plain of black cotton soil.

Karungu

Formerly a government station, but closed on account of its unhealthiness. Post office.

Situated on the rocky peninsula of Suri to the north of Karungu Bay, which is contained between Suri Point to the north, and Sowsow Point to the south, a distance of 3 miles, and recedes about the same distance north-east from the general shore line of lake. Karungu is 88 miles in a straight line south-west of Kisumu.

The former government bungalow is now the residence of the Indian customs officer. There is a colony of Indian traders, and a few native police. Karungu is a port of call for steamers circumnavigating the lake. Steamers anchor some way out, and landing is done by boat. The water is shallow and reedy. There is a rude stone jetty, at the end of which is a common street lamp. There is a goods shed, 30 ft. by 18.

The shores of Karungu Bay are low, swampy, and haunted by tsetse fly. They were formerly studded with Kavirondo villages, now deserted owing to sleeping-sickness.

Inland the country is a treeless expanse of grass.

The place is dangerously unhealthy on account of sleeping-sickness, malaria, and blackwater fever.

Usembo (Asembo) Bay

This bay recedes 4 miles due east, where Oyoma peninsula projects from the northern shore of Kavirondo Gulf. The village of Usembo lies on the north shore of the bay, and is 29 miles west by south from Kisumu.

Usembo is a port of call for steamers circumnavigating the lake ; it has a goods shed 40 ft. by 20, and an earth embankment faced at end by wooden jetty. Depth at end of pier, about 5 ft. A track runs to Kisumu.

Kadimu

Situated near north-east end of Kadimu Bay, on east side, 71 miles west by north from Kisumu in a direct line. There is no accommodation ; steamers call by request.

Kadimu Bay, deeply indented, recedes 7 miles north-east from the general shore-line of lake ; opposite the entrance of the bay is Mageta Island.

Sio, or Sio River

Situated on the east side of Berkeley Bay, at the mouth of Sio river, on left or south bank, $3\frac{1}{2}$ miles south-east of Mjanji in Uganda, and 94 miles north-west from Kisumu in a direct line.

Goods shed 50 ft. by 20. Earth embankment faced at end with a wooden jetty. Depth at end of pier about 5 ft. Lake steamers do not call at Sio.

Junction of tracks to Mjanji, Port Victoria, Mumias (33 miles to ENE.), and Mumias-Busia road.

The country (valley of Sio river) is flat and alluvial.

Samia hills (4,778 ft.) to east. Large native population in neighbourhood.

CHAPTER VIII

HEALTH CONDITIONS

General conditions of health : (a) for Europeans, (b) for natives, (c) for Asiatics—Ordinances and Rules concerned with public health—List of Hospitals, Dispensaries, Medical Officers, and Sanitary Inspectors—Sanitation—Prevalent diseases—Diseases of animals—Water-supply.

GENERAL CONDITIONS OF HEALTH

(a) *For Europeans*

THE question whether British East Africa can be fairly considered a 'white man's country', i.e. one where white settlers can find permanent homes and bring up healthy families, has been hotly debated. It can receive no final answer until longer experience has been gained and a third generation of settlers has come into being. At present the truth probably lies somewhere midway between the exuberant optimism of many writers and the somewhat gloomy impression derived from medical and sanitary reports. Outbreaks of disease can be met by energetic measures and should be reduced when systems of sanitation, too long delayed, are set in hand. Although epidemics attack Europeans comparatively rarely, such measures are urgently needed in the interest of the natives, and of the country in general ; a dwindling native population spells ruin to the European settlers.

Health conditions, of course, vary extremely in different regions : the tropical and malarial districts of the coast, (especially Vanga and those at the mouths of the Tana and Juba rivers), with those of Taveta and Voi, and the shores of Lake Victoria, are distinctly unhealthy for Europeans ; adults may live in them for a time, with intervals of leave, but would need to send their families home. On the other hand, the entire Highlands, especially above tsetse-fly and mosquito

level, have an agreeable and healthy climate with a light and dry air, and cool nights. The main drawback here is a tendency to nervous disorders induced by the combination of high altitude and strong sun. The statement often put forward that even in this region Europeans should go away every three years for a change has, like the whole health question, been much contested, but seems on the whole justified. There is also difference of opinion as to the desirability of children remaining in Nairobi and the uplands after the age of five or so ; up to this age they appear to thrive, but beyond this it is doubtful if any children should be allowed to stay on in the country. British East Africa has been proved to be entirely suitable as a permanent residence for settlers or animals coming from the Cape, after, e.g., two generations of acclimatization. The most favourable districts are as follows : round Machakos, Naivasha and the Rift valley, with the Uasin Gishu plateau, Kikuyu, the Nyeri plains, and West Kenya. Even the coast district near Mombasa and Lamu is less unhealthy than some tropical coast areas elsewhere, owing to the porous nature of the soil. The European death-rate throughout the colony shows a satisfactory and steady decrease from 14·9 per thousand in 1910 and 8·4 in 1912 to 6·6 in 1915. Adverse health conditions in the past have been largely due to the following causes : the rapid and haphazard growth of townships with no sanitary provision ; contaminated water-supply ; lack of funds for improvements in these directions ; the Asiatic immigration ; travelling of natives from infected areas to others ; neglect of proper accommodation and ordinary precautions for Europeans. Some of these precautions may now be summarized.

Accommodation.—Houses should be designed to exclude tropical sun and withstand tropical rainfall ; stone is the best material ; spacious verandahs are essential. Dwellings, in malarious districts, should be rendered mosquito-proof ; tanks containing drinking-water should be screened, puddles should be brushed dry, and any receptacles likely to hold water

after rain should be emptied. European dwellings, whether houses in town or camps in the open, should be at a distance from those of natives, and away from swamps and rivers. When camping, it is not advisable to sleep on the ground, but to use a camp-bed or waterproof sheet.

Bathing.—Bathing in a river, or in the open, should be avoided, and warm baths taken in place of cold. When travelling, the water for the bath should be boiled, for the servant may have taken it from a muddy pool harbouring parasites.

Chills.—These should be carefully avoided, especially in the rainy season.

Clothing.—Ordinary European clothing is suitable for the Highlands, woollen under-garments should be worn. At Mombasa tropical clothing is required for the greater part of the year. Everywhere a pith helmet (preferably) or a soft double felt 'terai' hat should be worn until after 4 p.m., when ordinary European headgear becomes safe. The back of the head, nape of the neck, and spine should be protected against the sun. Long boots, trousers, or puttees are better than shorts as a protection against insect-bites; as little bare skin as possible should be exposed, and walking barefoot should be avoided.

Drinks.—Alcohol should be taken after sunset only. Water should be boiled whenever possible, as this is the only means of destroying germs and parasites, but when this is not possible it should be filtered or chlorinated, care being taken to see that filters are kept clean. Standing or surface water should never be drunk; wells are often contaminated. Springs are the only safe source.

Food.—Uncooked food should never be eaten, for fear of contamination, nor should cooked food be left lying about. Vegetables and salads should always be washed in water that has been boiled. Good feeding is essential.

Malaria.—This, and sunstroke, are the dangers most likely to affect Europeans. Quinine and mosquito netting should be invariably used except in altitudes above mosquito level

(see p. 333). It is important to go to bed at once when there is any fever.

Snake-bite ; lion-bite. See p. 340.

(b) *For Natives*

The native population has suffered in the past from many causes, such as the slave-trade, intertribal wars, the cruelty of chiefs, and famine and pestilence. In the desert regions drought was added to the list. Cattle-plague often decimated the herds on which many of the tribes subsist, and starvation followed. Small-pox worked great havoc. Measures have now been instituted against diseases of men and animals alike, while the three first causes mentioned have been suppressed. Increased facilities for transport of food minimize the dangers of famine. On the other hand, new troubles, such as venereal disease and plague, have been introduced by the advent of white and Asiatic settlers, while labour conditions have, in some instances, adversely affected native health.

Evidence given before the Commission on Native Labour (1912-13) dwelt on the following as being the main predisposing causes of this deterioration. (a) *The movement of native labourers from their accustomed climate to another.* Natives from the Highlands succumb to malaria on the coast, those from the hot regions contract pneumonia or similar complaints in the Highlands, especially when insufficiently supplied with blankets—a frequent occurrence. In 1911, the Medical Officer reported that the death-rate of up-country labourers at the coast was at least 145 per thousand ; in the following year, a band of 500 Meru, of very fine physique, working at Mombasa, suffered severely ; several died there, 44 had to be detained in hospital, and about 40 others died on the way home or in their villages after their return. Many up-country natives become infected with ankylostomiasis at the coast, or take to *tembo* drinking (see below, p. 339). Owing to lack of protection against malaria and dysentery on the Nairobi to Fort Hall road works, about 60 men died in six weeks,

within a radius of two miles, in 1912. The need was urged for providing rest-houses under supervision on the main routes, with cooking arrangements, or labour camps, where advice as to life on the coast, and medical examination, might be had. (b) *Insufficient or unaccustomed food*. The usual allowance of maize or other meal has been too scanty and monotonous, the natives at home being used to meat, fish, flour, beans and other vegetables, green corn, millet, and so forth. (c) *Housing*. Huts have been run up with no drainage, water-supply, or protection against mosquitoes. When natives have been allowed to make their own grass-huts, care has not been taken to see that they have made satisfactory ones.

In his normal surroundings the average native is of good physique and general health, though some tribes show more vigour than others. Statistics for native birth-rate and death-rate cannot be given, as their registration is not compulsory nor, in many cases, practicable. It is known, however, that the Swahili birth-rate is so low that that race is in danger of dying out. Intestinal parasites are common among the natives (see p. 338). Drunkenness appears unfortunately to be on the increase among some tribes, e.g. the Kikuyu, Giriama, and Akamba; the favourite intoxicant is palm-wine (*tembo*), made on the coast. The Government has now put a tax on *tembo*, but it is suggested that the price should be raised. Some tribes, the Kavirondo in especial, ruin their health by smoking hemp (*bhang*), becoming decrepit in early middle life in consequence; this should be checked in future by the Abuse of Opiates Prevention Ordinance of 1913, by which the importation and sale of opiates are very strictly regulated.

There is nothing deserving the name of surgery or medicine as practised by the natives themselves, but they are becoming increasingly appreciative of European medical aid, though up to the present it may be assumed that a small proportion only of cases of sickness among them have come under European observation.

(c) For Asiatics

The crowding of Indian traders and storekeepers into towns like Nairobi, Mombasa, and Kisumu, and their penetration into up-country districts, present a serious problem, the solution of which is still under discussion. Considered from the point of view of hygiene only, and leaving aside the better-class and more enlightened Asiatic residents, this immigration must be regarded as disastrous. Far less cleanly in his person and habits than the native African, the low-class Indian has 'squatted' in certain areas, running up insanitary shanties, shops, and houses—dark, ill-ventilated, undrained; these, in spite of by-laws, he subdivides and overcrowds; in them he stores his goods, including grain and other foodstuffs; in them the rat runs riot, and parasites swarm. Rat mortality and early cases of plague are studiously concealed; infected families leave furtively, thus spreading the disease. The successive outbreaks of plague in Nairobi and Kisumu can invariably be traced to the Indian bazaars in those places, and, unless stringent measures are taken, similar plague-centres will spring up wherever Indians settle in the colony. The 'reeking squalor' of the Nairobi Bazaar has been condemned in the strongest terms by one medical authority after another, and nothing less than its complete removal should be tolerated. This, however, has not so far been authorized, on the ground of the expense involved, and the lack of accommodation for those who would be evicted.

ORDINANCES AND RULES CONCERNED WITH PUBLIC HEALTH

A series of ordinances and rules concerned with public health has been promulgated by Government, of which the following are the more important:

1903 (amended in 1917). *Infectious Diseases*. This enacts the notification of infectious diseases; the removal of patients and of corpses; the destruction of rats; the regulation of hospitals and of observation camps; the disinfection of

belongings, and similar measures. The Bill introduced in 1918, which, when sanctioned, will be known as the Public Health Ordinance of 1918, incorporates all that is not repugnant to itself in these Ordinances of 1903 and 1917.

1903 (amended in 1906 and 1918). Three Ordinances which, taken together, are known as the *Townships Ordinances 1903-1918*. 'For the health, order, and good government of townships.' The *Township Rules* of 1904 were made applicable to all townships proclaimed under the 1903 Ordinance, save where other provision was made. Modifications were introduced for some townships which have their own Rules, such as those framed in 1917 for Nairobi, Kisumu, and Mombasa respectively.

1906 (amended in 1915 and 1917). *Diseases of Animals*. See p. 341.

1907. *Plague and Cholera*. See below.

1909-10. *Sleeping Sickness*. See p. 336

1912. *Quarantine*. This supersedes the Plague and Cholera Ordinance of 1907, and provides for the setting up of sanitary stations.

1912. *Vaccination*. See p. 340.

1913. *Abuse of Opiates Prevention*. See p. 325.

1913. *Public Health*. This regulates building and the sale of land in townships, establishing a Board of Health for each.

1913. *Leprosy*. See p. 338.

1916. *Townships (Protection of Health) Rules*. These enact that persons leaving an infected area are to report at once to the medical authorities on arriving in any township.

1917. *Townships (Sanitary) Rules*. These deal with nuisances, including the breeding-places of mosquitoes and rats, giving the medical officers the necessary powers for anti-malarial work, for which convict labour is available.

1917. *Nairobi Township Rules*. These deal in great detail with the general hygiene of the town, e.g. buildings, drainage, markets, slaughter-houses, laundries, Indian and native eating-houses, lodging-houses, food shops, aerated

water manufactories, stables, vehicles, drains and irrigation trenches, suppression of mosquitoes, sanitary nuisances, provision of dustbins, notification of diseases, safeguarding the milk-supply, and reporting of deaths.

1918. *Public Health (Segregation of Races) Ordinance*. This deals with Reservations—European, Asiatic, or native. These may consist of residential or commercial areas, or of open spaces; residential land and buildings are not to be used for trade purposes. Europeans may not occupy land or buildings in an Asiatic area, or vice versa, unless the building was completed and so occupied at the commencement of the Ordinance; the rule is to be enforced when such occupation ceases. The only exception made is that of domestic servants lodging on the premises of their employer.

In 1918, a comprehensive and highly important Bill was introduced, which, as stated above, will be known when sanctioned as the *Public Health Ordinance, 1918*. If its provisions are carried into effect, and not allowed to become a dead letter, it should do much to remedy the unsatisfactory sanitary conditions that have hitherto prevailed in the colony. It sets up a central board of health, with the Principal Medical Officer and Principal Sanitary Officer among its members, having its seat at Nairobi and meeting at least once a month; it defines the constitution and powers of local authorities and the powers of medical officers (see below); it provides for the appointment of local sanitary inspectors, and deals with the question of Reservations (see above), and with the suppression of mosquitoes, rats, and other dangers to public health.

The local authority, which in many instances means the municipal council, is empowered to make byelaws concerning town hygiene, such as those mentioned above in the case of Nairobi; it has the right of inspecting buildings (to investigate sanitation or overcrowding) and of disinfecting infected premises; it controls the sewers and scavenging arrangements, including private drains and their connexion with public ones; it may prohibit noxious or offensive trades or manufactures,

and licenses stables, cattle-sheds, pig-sties, &c. Proposed plans for new buildings and for private streets must be submitted to the local authority, which prescribes the width of public streets ; the provision of hospitals and maintenance of cemeteries are in its hands also.

The Medical Officer has the power to enter and inspect any house or premises between 6 a.m. and 6 p.m. if infectious disease is suspected, giving two hours' notice in writing unless his object would be thus defeated ; with a special order from the local authority, he may enter at *any* hour, without notice. He may also inspect dairies, their staff, and cows, and buildings where food is to be stored must be rendered rat-proof to his satisfaction.

The whole question of the milk-supply is here put under much-needed control, remembering that in Nairobi, for example, 75 per cent. of the milk was found to be adulterated in 1915 and 64 per cent. in 1916. By this bill, the sale of milk from diseased cows is prohibited ; the local authority may forbid the keeping of milch-cattle in certain areas, and rules are laid down for the cleansing of milk-vessels, the examination of samples, and the prevention of contamination and adulteration.

Stringent rules are also laid down to secure the suppression of mosquitoes and rats. The breeding-places of both are considered as nuisances, and fines are imposed upon those who leave water uncovered in e.g. wells, gutters, barrels, or cess-pits, or who allow smaller receptacles, such as tins and bottles, to lie about. Cess-pits are to be screened, or treated weekly with larvicide, gutters and pipes to be perforated. Fines are similarly imposed on those whose premises contain rat-holes or rat-runs or have no gratings over the ventilating openings. All food must be kept in bins.

In times of epidemics, the central board may make regulations for house-to-house visitation, the speedy interment of the dead, removal of the sick and of contacts, destruction of rats, destruction or disinfection of buildings, provision of hospitals and observation camps, and closing of cemeteries.

HOSPITALS, DISPENSARIES, MEDICAL OFFICERS, SANITARY INSPECTORS

The following is a list of hospitals, dispensaries, medical officers, and sanitary inspectors, in British East Africa. In some cases the class of hospital has not been ascertained.

Hospitals

Nairobi ((1) European, (2) civil (Goans, Africans, Asiatics)) ; Mombasa ((1) European, (2) civil, (3) prison)) ; Fort Hall (civil) ; Kisumu (civil) ; Lamu (civil) ; Nakuru (civil) ; Nandi ; Serenli (military) ; Voi. There were a hospital and sleeping-sickness camp at Kisii Boma in 1915, but it is not certain if the former still exists there.

Dispensaries

Alexandra (Jubaland) ; Eldoret ; Fort Hall ; Kismayu ; Lamu ; Marsabit ; Nakuru.

In addition to the above, there are a lunatic asylum at Nairobi, the leper settlements mentioned on p. 338, and hospitals connected with the various missions, e.g. the C.M.S. hospital at Mzima (Mombasa), with 60 in-patients in 1918, and branch dispensary at Weichaga (Kenya Province) ; the Hunter Memorial Hospital at Kikuyu and a hospital at Tumutumu (Nyeri), both belonging to the Church of Scotland Mission ; and a hospital at Kijabe in connexion with the Africa Inland Mission, which last also carries on dispensary work at several others of its stations.

Several hospitals and houses, e.g. at Nairobi, were used as military hospitals during the war.

The total number of cases other than military receiving treatment as in-patients or out-patients in Government hospitals during the latest years for which figures have been obtained are as follows : 120,156 in 1914 ; 117,573 in 1915 ; 116,552 in 1916.

Medical Officers

Nairobi ; Mombasa ; Eldama Ravine (Indian) ; Fort Hall ; Kismayu ; Kisumu ; Kyambu (Indian) ; Lamu ; Marsabit ; Nakuru ; Serenli.

In 1913, the urgent need for a European medical officer in the North Kavirondo district, with its population of over 300,000, was reported.

Sanitary Inspectors

Nairobi, Mombasa, and Kisumu.

SANITATION

Sanitation has not in the past kept pace with the rapid development of the colony, funds for medical and sanitary schemes have not been forthcoming, and there has been a lack of the necessary co-operation between the Government and the municipal authorities. The condition of things at Nairobi was described by various expert witnesses in the Report of 1913 as 'pretty bad', 'a grave danger to public health', 'in a disgraceful state'. A careful drainage scheme which had been inaugurated in 1906 had then made little progress. Representations from medical officers and leading citizens were persistently ignored. Other townships were hastily inaugurated without any adequate sanitary provision ; in many the water-supply, as at Kisumu, was contaminated. The removal of standing water, in which mosquitoes breed, was neglected, or very partially carried out ; no attempts were made to render houses mosquito-proof.

But in the last few years, especially since the visit of Professor Simpson (the expert sent out in 1913 by the home Government to report), improvements are being carried out, as the series of ordinances and rules above described will show. Nairobi, Mombasa, and Fort Hall have now an improved water-supply (see *Gazetteer of Townships*) ; drainage at Nairobi and Fort Hall is being extended and improved ; road drains have been constructed in the low-lying area round

Mombasa ; more care is being taken in planning new townships. Nyeri, for example, is described as a sanitary model. In several places septic tanks have been introduced. The porous soil at Mombasa has remedied to some extent the past lack of proper drainage, and has prevented the collection of stagnant water ; a scheme for the improvement of the town was put forward by Professor Simpson. Sewage in the towns is still collected by the single bucket system, and is thrown into the sea, or buried in trenches and pits ; the supply of duplicate buckets and of refuse destructors would be an improvement. Additions should be made to the number of public latrines ; this is now being done in Nairobi.

In planning new towns, it is recommended that ' a neutral or protective zone ' should be left open between the European, the African, and the Asiatic quarters. A greatly increased sanitary staff, with representatives throughout the colony, is required, together with more liberal expenditure on a sanitary programme. This would pay in the long run, as epidemics affect the country economically, by causing a shortage of labourers and reduction in the number of ships calling at the ports.

PREVALENT DISEASES

The most serious diseases of the colony will first be treated, then the others, in alphabetical order.

The following classification of districts is adopted in accordance with the practice of the annual medical reports :

1. *Coast*, i. e. Seyidie and Tanaland Provinces.
2. *Mountain zone*, i. e. Ukamba and Naivasha (Uasin Gishu and Trans-Nzoia).
3. *Desert zone*, i. e. mainly Jubaland and the northern frontier district.
4. *Nyanza and Kenya Provinces*.

The diseases that cause the most serious trouble in British East Africa (since the practical extermination there of sleeping-sickness) are malaria, cerebro-spinal meningitis, plague, dysentery, and, on the coast, ankylostomiasis (hookworm disease).

Malaria.—All three forms of malaria are found ; the type is less virulent than in some other tropical regions. All parts of the country below 5,000 ft. are more or less subject to it, the worst districts being the Jubaland swamps, the coast, Kisumu, and Voi. Until recently the lack of preventive measures in Nairobi, Mombasa, and Kisumu left those towns as happy breeding and hunting grounds for the mosquito, but, as already described, an anti-malarial campaign is now being conducted, and mosquito destruction gangs are maintained in all three places. The measures taken include the clearing of bush ; the treating with oil of pools and marshes ; the removal of waste and stagnant water and of such objects as empty tins and bottles in which it collects ; the piercing of roof-gutters ; the screening of rain-water tanks, and the distribution of quinine gratis. In malarial regions much still remains to be done in all these directions and in the mosquito-proofing of dwellings generally. Five grains of quinine in soluble form should be taken daily as a prophylactic, and a really effective mosquito netting should invariably be carried and used. Camping near native huts should be avoided. The worst months are those just after the onset of the rains and for some time after they cease (November and December ; March to June inclusive).

The number of malarial cases treated in two recent years was as follows :

	1914-15.	1915-16.
Coast Zone	5,489	7,112
Mountain Zone	3,851	5,352
Kenya Province	1,900	} 4,687
Nyanza Province	2,300	
Desert Zone	not known	1,666

For Blackwater fever, see p. 337.

A great number of different species of mosquito (Swahili, *umbu*) are found, the three great genera, *Culex*, *Anopheles*, and *Stegomyia*, each having several representatives. The *Anopheles* is most to be dreaded. Three of its species are known to transmit malaria—*A. pyretophorus costalis*, *A. funestus*, and *A. mauritanus* ; the two first also convey

filariasis. The *Anopheles* has short, dark bars or spots on the front edge of its wings, and is small, slender, and straight (in contradistinction to other genera, which are usually bent or hump-backed); it does not as a rule fly far from its breeding-places, and bites chiefly at night. *A. pyretophorus costalis* is the most common disease carrier at Lamu, in south Tana-land, and on the Yala river. *Stegomyia fasciata* (also called *calopus*) is striped black and white. It swarms near the Lorian River, within a radius of 5 miles from the water, and is found in Jubaland, near Nairobi, and at Kisumu. It is the carrier of yellow fever but that disease has, happily, not been introduced into East Africa.

Cerebro-spinal meningitis.—The first serious occurrence of this disease was in 1913, when there was a disastrous outbreak in Kenya Province. This spread through the provinces of Ukamba, Naivasha, Seyidie, and Nyanza, reaching outlying places like Machakos and Kitui. It coincided with an outbreak of plague. Between May 1913 and January 1914 over 1,100 deaths were reported by doctors, over half of them from Kenya Province. It was impossible to ascertain the exact death-rate among the natives, but it was enormously high. Labour in many parts was at a standstill. The coast belt, however, was left practically untouched. The greatest number of cases were during the cold, dry months (May to August inclusive). In some instances they were diagnosed by lumbar puncture and successfully treated with intra-muscular injections of soamin (5 grains to the dose).

In the year 1914–15, there were 136 cases (with 51 deaths) in the mountain zone (106 of them at Nairobi), 45 cases (with 28 deaths) in the Kenya and Nyanza provinces, and 33 cases (with 12 deaths) in the coast zone. The following year saw a considerable decrease in all districts, i.e. 81 cases in the first, and 27 in both the second and third.

The best precautionary measures are care in the use of towels and handkerchiefs, and irrigating the nose with some antiseptic lotion.

Plague.—The native name for plague in Uganda and neigh-

bouring districts is *kawampuli*, among the Kavirondo, *kabwira*. The type found in British East Africa is mainly bubonic, but there is also a large proportion of pneumonic cases. It is apparently endemic in the Nyanza basin, in the Taveta district, among the Ndara and Sagalla hills (near Voi), and in Nairobi and its environs. But many recent outbreaks have been due to importation from Arabia, Persia, Mesopotamia, and (since 1896) from Bombay, and to the appallingly insanitary, rat-infested Indian bazaars at Kisumu and Nairobi (cf. p. 326). There has been an outbreak of plague at Kisumu every year since 1904, except 1907, and outbreaks at Nairobi in 1902, 1905, 1906, 1911, 1912, 1913. In 1912-13 there was an epidemic at Mombasa (probably imported by railway from Kisumu or Nairobi rather than by sea), with 208 cases. Plague has also appeared sporadically at e.g. Machakos, Makindu, Maragoli, Kyambu, and Dagoreti. Conditions at Kisumu are especially favourable to the spread of plague, as it is a great emporium for grain and cotton-seed, piles of which lie on the steamers and piers, and are stored in Indian shops, and swarm with rats. When there is a mortality among rats, the Indians leave the place, and the Kavirondo are beginning to do the same, thus the infection is spread. The northern limit which it had recently (1913) reached was Yala, between which place and Kisumu there is much traffic. The worst months are May and June.

Europeans, owing to their greater cleanliness, very rarely contract the disease, and a successful anti-plague campaign is now being carried on at Mombasa and elsewhere. The measures taken include house-to-house visitation, fumigation, inspection of travellers, segregation, notification of mortality among rats, and the killing of rats, 'Claytonising' (i.e. disinfection by Clayton gas machine) of houses, and inoculation with Haffkine's prophylactic. The cleansing effects of strong sunlight are also recognized, infected houses have had their roofs temporarily removed to admit it. There is an urgent need for the inspection and fumigation of lake steamers carrying hides and unginned cotton; for the erection of

rat-proof stores ; for the prohibition of transport of unginned cotton from plague areas ; and for the supply of hospitals or camps for infectious diseases ; the infectious hospital at Kisumu is in the centre of the town, and should be moved away.

Several species of fleas, in addition to the usual plague vector, *Pulex cheopis*, have been found on rats in British East Africa.

Dysentery.—This is a serious trouble, largely owing to unsatisfactory water-supply, and appears to be on the increase. Both the bacillary and amoebic types are found, but the former predominates. In 1915–16 there were 317 cases (with 39 deaths) in the coast zone, 1,647 cases (with 89 deaths) in the mountain zone, 651 cases (with 39 deaths) in the Kenya and Nyanza provinces (as against 492 cases in the previous year), and 107 cases in the desert zone. Jubaland suffers severely, both along the river and near Kismayu, owing to the bad drinking-water. There was a serious outbreak at Meru in October, 1916, with 600 deaths in a month. In treating cases, hypodermic injections of emetine and quinine have been employed. Precautionary measures include the sterilization of drinking water by boiling, or, when this is impossible, by chlorination, and the avoidance of uncooked food, see p. 323. Human ‘carriers’ should, when possible, be detected and isolated.

Sleeping sickness (trypanosomiasis) has never presented the same serious problem in British East Africa that it has done in Uganda. It was confined to an isolated area—the Kavirondo gulf of Lake Victoria Nyanza, the lake-shores, and, inland, the Karungu and Nyakuru districts, with the valley of the River Kuja. The disease is supposed to have been imported some fifteen years ago by Congo traders ; in 1910, 96 cases were treated, with 22 deaths. The ambach swamps and bush which harboured the tsetse-fly (*Glossina palpalis*) were cleared, the population of the native villages was removed, and a sleeping-sickness camp set up. Since then the danger has diminished yearly. In 1915 there were only four known cases in all, three treated in the Nairobi hospital and one in Nyanza Province. The Government has since allowed villages to be

rebuilt higher up on the hill slopes. The camp has been abolished, the main control now being by inspection of labour passing through Kisumu. The question of the destruction of wild game as harbourers of trypanosomes has been much canvassed, but the measure, apart from the difficulties involved in carrying it out, would seem to be ineffective, as domestic animals, birds, and even certain insects are known to be similarly infected. Moreover, in some districts, big game, e. g. buffaloes, are found, but no tsetse, and vice versa.

Glossina palpalis is the only tsetse-fly as yet definitely convicted of conveying human trypanosomiasis, though certain other species are under suspicion. It is of a dark-grey colour above and a light grey below ; it is only found near water, and in shade or vegetation. It rarely bites except when the sun is hot.

For the tsetse-flies conveying the disease to animals see p. 216.

The following is a list, alphabetically arranged, of other prevalent diseases, with some brief notes upon them :

Ankylostomiasis.—See under *Parasites*, p. 338.

Beri-beri.—This is not much found. It is a form of paralysis due to absence of vitamins in diet, e. g. in polished as opposed to unpolished rice. It caused a serious outbreak, with high mortality, on the upper Juba in 1912–13, followed by a milder one, with no deaths, in 1914–15. Twenty-eight cases were reported at Voi in 1913, 41 in the native hospital at Mombasa in 1915, these last were probably imported only.

Bilharziasis.—See under *Parasites*, p. 338.

Blackwater fever.—This is not very frequent ; in 1914–15 17 cases in all were reported, of which 9 were Europeans ; in the following year, 19 cases, of which 4 were Europeans. The fever only follows repeated attacks of malaria, and usually results from imprudence during convalescence from them. The distinguishing symptom is the passing of black water. The condition is serious, but, with absolute rest and medical advice, recovery often takes place. Quinine should not be taken unless ordered by the doctor.

Cholera.—Epidemics of cholera occurred in the years between 1864 and 1870, travelling along the caravan routes and from town to town, but there has been no recent recurrence.

Dengue fever.—A few cases are found on the coast.

Digestive troubles.—These are fairly common, especially among children.

Elephantiasis.—See under *Parasites*, p. 339.

Enteric.—The type that has prevailed has been non-virulent, and it is hoped that improvement in the drinking-water supply will reduce it. The recognition of 'carriers' among the natives, and inoculation for typhoid (including paratyphoid A and B), should help to the same end. In 1915-16, there were reported 12 cases in the coast zone (with 5 deaths), 182 in the mountain zone (with 19 deaths), and 2 in Kenya and Nyanza provinces.

Eye troubles.—These are found mostly in the desert zone and are due to glare, sand, and flies.

Leprosy.—This is fairly common among natives in Kenya and Nyanza provinces, and on the coast. In 1915 there were 436 lepers under care in the settlements at Mkonumbi near Lamu, Malindi, and Mombasa; the last belongs to the C.M.S. The acquisition of Mackongwe Island (near Mkaoni) by the Government has been suggested, as a suitable spot for lepers from British East Africa and Zanzibar.

The Leprosy Ordinance of 1913 regulated the provision and management of State asylums (the cost of which was to be defrayed from public revenue), the compulsory inspection of private asylums, and the examination and detention of lepers.

Nervous complaints.—Nervous irritability or depression is frequently produced after a time by the combination and tropical sun and high altitude. A temporary change of scene or occupation is indicated.

Parasites.—Parasites, both internal and external, are numerous and varied, and cause much ill-health. Among the former may be mentioned the minute worms causing ankylostomiasis (hookworm disease), bilharziasis, and filariasis; taenia is also common in natives and their cattle, more

especially in the Lamu district. *Ankylostomiasis* is found chiefly on the coast; it has been estimated that about one-fifth of the natives on Mombasa Island are probably infected, though the disease is often not diagnosed. Infection is caused by walking barefoot on contaminated soil or by drinking contaminated water. *Bilharziasis* is also found chiefly on the coast, and is due to infected water, absorbed either by bathing or drinking. *Filariasis* is most commonly found in the form of elephantiasis, especially, for example, among the Nandi on the Yala River. It has been estimated that 30–40 per cent. of the natives round Lamu are infected by *Filaria nocturna*, and there are centres of infection also on the Tana River.

Among external parasites, the most troublesome are ticks and jiggers (or chiggers). Ticks (Swahili, *kimputu*) swarm in native houses and in old camping-places along trade-routes; these should accordingly be given a wide berth. The Athi plains are infested by them. The tick *Ornithodoros moubata*, which conveys spirillary (or relapsing) fever to man, is common, e.g. among the Kavirondo. His manners and customs resemble those of the bed-bug, but he may be circumvented by tying rags soaked in paraffin round the legs of the beds. The spirochaete of relapsing fever may also be conveyed by lice. The disease is endemic at Marsabit, and cases have occurred elsewhere in British East Africa. There are several other species of ticks, seriously affecting animals (see p. 342).

The jigger or sand-flea (*Sarcophylla penetrans*) is reported among the Kavirondo, in the mountain zone, and on the coast; the female burrows under the skin of the foot, and there lays its eggs. Walking barefoot should be avoided, and the feet carefully examined each day. Natives are expert in extracting jiggers with a knife or sharpened stick.

A preventive against insect pests in general is to coat the floor of the hut with a strong decoction of native tobacco, and to fill up all chinks and crannies.

Pneumonia.—Pneumonia and other respiratory troubles are fairly frequent. In 1915–16, 347 cases were reported from

the mountain zone; this was considered a fair average annual number.

Rheumatic affections.—These give trouble in the wetter months, especially round Mount Kenya.

Small-pox.—Small-pox has ravaged the natives periodically in the past, but is now being met by energetic measures. In 1913 there were 131,757 vaccinations, in 1915 there were 162,184. The Vaccination Ordinance of 1912 introduced compulsory vaccination in infected areas for all adults and children who had not previously been vaccinated successfully, or had had small-pox. Exemption was allowed for religious objectors, but had to be obtained in writing from the Governor; it was also allowed on health grounds by a medical certificate requiring renewal at the end of six months. Public vaccinators for such areas were provided, and free vaccinations. With certain stated exemptions, the vaccination of persons landing from infected ships was also rendered compulsory.

An extensive epidemic of small-pox unfortunately broke out in Nyanza Province in June 1916, spreading to Kenya and Ukamba provinces.

Spirillary fever.—See under *Parasites*, p. 339.

Tuberculosis.—This is common among the Somalis, and is reported by medical missionaries to be spreading among the natives generally. It has been noticed among the Kamba.

Typhoid.—See *Enteric*.

Venereal disease.—This is also, unhappily, spreading. In 1915 the hospital cases were as follows: from the mountain zone, 410 (syphilis) and 316 (gonorrhoea); from Kenya and Nyanza provinces, 312 (syphilis) and 197 (gonorrhoea).

Yaws (Framboesia).—This contagious skin-disease is common in Kenya Province. In 1915 there were 126 cases in the hospitals of the mountain zone. A medical missionary has estimated that 40 per cent. of trans-Tana labourers are incapacitated by disease, mainly yaws.

In addition to the above must be mentioned veldt sores, wounds from the bites of lions and leopards, and snake bites. Wounds from bites need, of course, thorough cleansing, and

crystals of permanganate of potash should be rubbed in ; a small tube containing the crystals and a lancet (this is known as Lauder Brunton's lancet) should be kept handy.

Intense local irritation and often fever are caused in human beings as well as animals (q.v.) by the stings and bites of flies other than the mosquito or tsetse ; for example, various species of *Tabanidae* (serut-flies) or *Oestridae* (gad-flies), the *Stomoxys* (cattle-fly), and the Congo floor maggot-fly (*Auchmeromyia luteola*). There have been some suspected cases of phlebotomus (or sand-fly) fever in British East Africa, but the transmitting agent *Phlebotomus pappatasii* (really an owl-midge, not a sand-fly) has not yet been identified there. Of the true sand-flies (*Simuliidae*) there are several, including a new species, *S. dentulosum*, found on Mount Kenya and near the foot of Mount Elgon.

DISEASES OF ANIMALS

The diseases from which cattle, sheep, and horses have suffered in British East Africa have been often imported from Abyssinia, the Cape, or by sea, and have been spread, as already stated, by surreptitious movement within the country from infected areas into others ; they will be reduced by the strict quarantine measures now in force, and the effective combating of the two chief disease-vectors, ticks and flies. Native stock has been proved to be more immune than imported stock.

The Government Veterinary Department prepares vaccines, and conducts investigations and experiments in the pathological laboratory at Kabete near Nairobi. There are veterinary officers at Mombasa and Nakuru. The Diseases of Animals Ordinance is enforced by the same Department ; it was first passed in 1906, but was amended in 1915 and 1917. It enacts that all imported cattle must have a certificate showing that they have successfully passed the tuberculin test ; those which are found to react to that test are slaughtered. The veterinary officer at Mombasa examines all stock coming in by sea, and maintains a fly-proof stable.

The diseases conveyed by ticks and by biting or blood-sucking flies will first be treated, introduced in either case by a brief note on ticks and flies ; then other diseases, in alphabetical order.

Ticks.—The ticks that work most havoc among cattle and sheep are three species of the genus *Rhipicephalus*—*R. evertsi* (a red-legged tick), *R. appendiculatus* (large and brown), and *R. pulchellus*. The second is the known transmitter of East coast fever ; the last is under suspicion of doing the same, but his guilt has not yet been established by experiment. As already said, these ticks abound near the Athi River (see *Insect Pests*, p. 215). Two species of *Amblyomma* are common near Marsabit, and cause serious abscesses in beasts.

East coast fever, which is identical with the disease known as South African fever, is a serious hindrance to dairy-farming in British East Africa. It can only be prevented by treating the animals every three days with an arsenical dip. There is a model Government dipping plant at Nakuru, and 80 or more others throughout the country. Adult cattle in the most densely-stocked districts (e.g. Kavirondo, parts of Lumbwa, Sotik, the Nyeri plains, and the neighbourhood of Nairobi and Kikuyu and Machakos) appear to be practically immune. This seems due to their recovery as *young* animals from the disease ; those who contract it first when mature invariably succumb.

Gastro-enteritis of goats and sheep is also conveyed by *R. appendiculatus*. It is enzootic in some districts, notably the Kikuyu country. Grade and pure-bred sheep prove more resistant than native sheep, among which the mortality is about 70 per cent. of those attacked. Preventive inoculation seems to be no good. The eradication of ticks is the great object at which to aim.

Texas (or Redwater) fever is also conveyed by ticks, and has been fairly prevalent and serious among imported stock, though inoculation is now lessening the danger. Native stock suffers little for the same reason as in the case of East coast fever (see above).

Both fowls and dogs also suffer from tick-fever. Imported dogs can now be successfully treated with trypan blue, to be obtained of the veterinary authorities.

Flies.—Horses, cattle, camel, sheep, and dogs are all affected by various forms of trypanosomiasis (Arabic, *nagana*), conveyed by several species of *Glossina* (tsetse-fly), or of *Tabanus* (serut-fly), or, in the case of cattle, by the cattle-fly (*Stomoxys*). Other biting or blood-sucking flies, such as the *Haemotopota*, are suspected agents. Flies have been known to be carried long distances from infected areas by train (cf. *Insect Pests*, p. 215).

(a) The *tsetse-flies*, other than *palpalis*, found in British East Africa, are as follows: *Glossina brevipalpis*, the commonest tsetse in the country, a large brown fly known to convey more than one trypanosome; *G. pallidipes*, akin to *morsitans* (see below), infesting rivers, the Mombasa coast, and a belt extending for 225 miles up the Uganda railway (from the coast to Simba); *G. longipennis*, a dusky-brown fly, found in arid, desert country, e.g. round Marsabit; *G. longipalpis*, conveying the *Trypanosoma dimorphon* (possibly the same as *T. pecorum*), and *G. fusca*, a large, dusky-brown, found on the Mara River in the South Masai Reserve. *G. morsitans*, the usual conveyer of animal trypanosomiasis in the Sudan, is so far unknown in British East Africa. All the above convey trypanosomes, but these have not all yet been identified; *T. gambiense* does not seem to occur, but trypanosomes closely resembling *brucei* and *evansi* have been found; these are probably conveyed by *G. pallidipes*. The belt infested by this fly, to which allusion has already been made, can only be traversed by animals at night (this species being a day-biter), or in fly-proof vans on the railway. This fly is the chief agent in Jubaland camel-disease (see below). *Pallidipes*, *brevipalpis*, and *longipalpis* are all found at Kibwezi. There is also 'fly' all down the Tana River (cf. p. 215, *Insect Pests*).

(b) Two species of *Tabanus* known to transmit disease are *T. africanus* and *T. latipes*. The former haunts the forests west of the Juba, the Seyera swamp, and coast swamps; the

latter, which draws blood, and reduces cattle until they are unfit for work, is found e.g. in Witu. It has barred wings.

Trypanosomiasis.—In this disease a general loss of condition in the animals is almost always followed by death; there is no known cure, and infected beasts should be destroyed. The humped Kavirondo cattle have acquired immunity from *nagana*, possibly by long exposure. Jubaland camels suffer much from the disease, in both an acute and a sub-acute form. When passing through fly-belts, natives often smear their beasts with liquid cow-dung as a protection.

Several cases occurred among horses in 1914.

Camel-mange.—Camels suffer from mange, especially during the rains. This may be treated with repeated dressings of sulphur and sim-sim, after a preliminary washing with water containing soda.

Camel-sickness.—This chiefly attacks camels brought from the interior to the coast, and is usually fatal. The symptoms are loss of appetite, violent colic, blindness, a discharge from the nostrils, and swelling about the head.

Contagious lymphangitis.—This disease affects horses, causing ulcers, and is difficult to treat. A quarantine station for infected animals has been set up.

Contagious pleuro-pneumonia.—A dry cough is a symptom of this disease; it may be treated by inoculation.

Horse-sickness.—In 1912 it was stated that there had been no bad season of this since 1904, though occasional cases are found in most years. It is often fatal. The disease is probably transmitted by mosquitoes or other insects. Stables should be made proof against mosquitoes and should not be near water; greenwood fires should be kept burning at night. Horses should be smeared with a little kerosene oil if out after sunset. Infected animals should be isolated.

Rinderpest.—There was a terrible epidemic of this in 1889-92, which killed off cattle and buffaloes, and caused the death of many natives from starvation in consequence. Between 1910 and 1912 there was an outbreak among the Masai herds

on the Laikipia plateau, and heavy mortality ensued among the Kavirondo cattle. But since then the disease has been dying out in many districts, largely owing to the use of anti-rinderpest serum supplied from the Kabete laboratory. It is now stated to be almost confined to Uganda and the adjoining native territories.

Sheep-scabies.—This is prevalent among native flocks, and does great damage to wool-producing sheep. Dipping is the cure.

Swine-fever.—A particularly virulent form of this is found. It is hoped eventually to produce a serum with which to treat it.

WATER-SUPPLY

None of the water-supplies in British East Africa are safe to drink from without purification except those emerging direct from springs. Even the mountain streams in the Highlands, though pure in themselves, are liable to pollution, while the new supply at Nairobi, though originating from springs, is yet liable to contamination in its reservoirs, especially during the rains. This defect is due to the reserved area round the springs being too small and not sufficiently exclusive. The danger, as pointed out by Professor Simpson in his Report, will become more serious with the increase of traffic at the station close by and with the growth of population. There can be no doubt that a great improvement in public health will follow the supply of properly purified and safeguarded water to the towns, even if the source be a river.

For the existing water-supply of the towns, see *Gazetteer*; for the water-holes, wells, and running water of the country generally, see *Physical Geography*.

CHAPTER IX

COMMUNICATIONS

Waterways—General description of roads—Transport—Main communications with surrounding countries—Coastal region—Taru desert—Voi-Taveta road and connected tracks—Note on Lake Jipe and the Parc Mountains—Eastern Highlands—Rift Valley and Western Highlands—Lake District—North Frontier Province and Jubaland.

THE principal line of communication in British East Africa is the Uganda Railway, which, together with its branches, will be found described in the volume on 'African Railways'.

The Protectorate is not well provided with roads and navigable waterways, presenting in this respect a great contrast to the neighbouring Protectorate of Uganda.

WATERWAYS

Of the waterways, the most important is the Victoria Nyanza, which is linked to the coast by the Uganda Railway, and affords communication with the ports of Uganda and Tanganyika Territory (see 'Harbours' and the volume on 'African Railways').

The river Juba, which forms for some 500 miles the frontier with Italian Somaliland, is navigable by small steam vessels as far as Yonti 14 miles from its mouth, all the year round. Steamers drawing 3 ft. of water, can usually get up to Serenli, 300 miles from the coast, from June to November, the exact period in a given year depending upon the conditions of rainfall in Abyssinia. The river is full of 'snags', and two steamers have been sunk recently as the result of striking them. The sandbanks at Liwitu shift about, and steamers frequently get stuck for days at this spot. In fact it is only when the river is in high flood that steamers can pass at all.

The La Hele Rapids, 16 miles above Serenli, now prevent any further navigation. This, however, could be remedied, either by blasting the rocks, or by the use of small flat-bottomed tugs, which could be put on wagons, and taken past the falls. Above the falls the river is navigable again as far as Dolo.

The Tana, when in flood, is navigable by shallow draught steamers for 320 miles from the coast. Above Hameye, which marks the limit of navigation, the Tana is a mountain stream, with huge falls, cataracts, and rapids, which make it useless even for floating down timber. Many of the creeks and estuaries along the coast are navigable for a short distance by dhows. In Jubaland the Birikau River is navigable by vessels, drawing 4 ft., for 20 miles, and the Arnoleh (Anole) creek can be ascended by dhows for the same distance. (For full details see ' Harbours ').

The streams, which flow into the Victoria Nyanza, are of no great size, and of no importance as navigable waterways to the interior.

GENERAL DESCRIPTION OF ROADS

Speaking generally the roads are not good, and have failed to keep pace with traffic developments. Considerable improvements have been effected in certain districts, even during the war, but more and better roads are badly needed to open up the country. At present there are no metalled roads outside the larger towns, such as Mombasa and Nairobi. The roads are of earth, pounded hard with stampers, and, near the towns, with steam rollers. In those areas, such as the highlands, where the rock is volcanic, muram (see ' Geology ') is used for surfacing. It is an excellent metal, which breaks up readily and binds well to form a hard smooth surface, but it will not stand heavy traffic. The Indian ox-cart, with its narrow wheels, is very destructive to it. Legislation to secure a minimum breadth of tire has at present been refused, owing to the great need of carts of any description.

Throughout the country wooden bridges are being replaced, as rapidly as possible, with bridges of reinforced concrete. Lack of cement is the great difficulty.

The Uganda Railway traverses few of the richest agricultural districts, the main object of its construction having been to connect Uganda with the sea. Thus districts like West Kenya and the Uasin Gishu plateau lack the communication necessary for their development. A new railway is projected to run from Nakuru to Mumias, and the survey of it has been completed since the war. It will pass through the Molo valley, the richest grain district of the Protectorate, the cedar forests of Mau, the Uasin Gishu plateau, and the fertile North Kavirondo country, and will thus be freight-producing all the way. An extension of the so-called Thika tramway, which at present runs only from Nairobi to Chania bridge, is much needed to open up the West Kenya district.

TRANSPORT

Two great hindrances to communication are the scarcity of water over large areas, and the fact that many districts are infested with tsetse fly. Where fly is prevalent animal transport is impossible. There can be no doubt that the motor is the form of transport best suited to the country, but for this more and harder roads are required. Cars of a high clearance must be used; low cars are useless. In certain districts motors can go anywhere in the dry season, as in the open parts of the Serengeti plains, the Masai plains, and the central portion of the Rift valley round Naivasha. Human portage is not so easily obtainable as formerly. The natives have made what is for them a considerable sum of money out of 'war work', and have become independent.

In the North Frontier Province, and in the greater part of Jubaland camels are necessary for transport. In the former province the Rendile own large herds of camels, which are used to the rough lava-strewn tracts. The ordinary desert camel is of no use for this type of country. Some authorities consider that if the zebra could be domesticated it would

solve many difficulties, since it is immune from tsetse-fly and is said to be able to cover greater distances without water than any other animals, except camels. It is, however, doubtful whether zebras bred in the highlands would be immune from the fly in the lowlands. Other authorities say that the zebra is weak and not a willing worker, and put the mule next to the camel in being able to go without water. The breeding of jennets from pony stallions and donkey mares would probably produce a very good class of transport animal. Animals carry or drag the following weights: camels, 240 lb. ; donkeys, 100 lb. ; wagons drawn by 18 oxen, 3,000 to 3,600 lb. A good baggage camel when loaded can travel 4 or 5 days without water and not feel the lack of it very much. It can even go 9 days, but is then very much exhausted, and needs a long rest before it can recover its strength. A good desert-bred donkey, when loaded, can easily go one day without water, and the same is the case with a desert-bred bullock working on a fully-loaded wagon. Animals kept too long without water do not eat, and therefore rapidly become weak from hunger as well as thirst.

If it is intended to administer properly the North Frontier Province and Jubaland it is absolutely necessary to build a railway, or construct good roads for the use of mechanical transport. It is difficult to secure camels, donkeys, and transport oxen in sufficient quantities. Outbreaks of disease among them are frequent. There are long waterless tracts to be crossed, and on some of the routes there is insufficient grazing. Great dissatisfaction is caused among the natives by the constant call upon them for animals, especially camels, to replace casualties.

MAIN LINES OF COMMUNICATION WITH SURROUNDING COUNTRIES

The principal lines of communication between British East Africa and Tanganyika Territory are by (1) the coast route from Mombasa to the Umba River and on to Tanga, (2) the Voi-Taveta-Moshi road through the gap between the northern

Pare mountains and Kilimanjaro, shortly to be superseded by the railway, and (3) the Uganda Railway, and lake steamers to the ports of Mwanza and Bukoba. Since the war a fourth route has been made from Nairobi through Kajiado on the Magadi Railway to Mount Erok and Mount Longido.

With Uganda the principal line of communication is the Uganda Railway, connecting by steamer with the ports of Jinja and Entebbe. This is also the chief communication with the Sudan and Belgian Congo, by the Jinja-Namasagali railway, steamer to Port Masindi, and motor from Port Masindi to Butiabwa on Lake Albert, whence steamers run to Nimule in the Sudan, and across the lake to Belgian Congo.

Communications with Abyssinia are mainly (1) from Kismayu to Moyale, the frontier station on the Goro escarpment, and (2) from Nairobi and Meru by Archer's Post on the Guaso Nyiro, and Marsabit to Moyale.

Italian Somaliland is reached by sea, or by road from Kismayu to Gobwen and by ferry across the Juba to Gumbo.

COMMUNICATIONS IN THE COASTAL REGION

Communication between different places on the coast is mainly by sea (see 'Harbours', especially Mombasa, Lamu, and Kismayu).

A cleared road runs from Mombasa to the Umba river. Kilindini harbour is crossed by ferry to Likoni, whence the total distance to the Umba river is 59 miles. The road is good for motor traffic as far as Msambweni, at mile 32 from Likoni. Tiwi is passed at mile $13\frac{1}{2}$ and Gazi at mile $27\frac{3}{4}$. There is a government traffic bridge across the Mwachema river at mile 15. The mangrove swamps south of Gazi and at Msambweni are crossed by causeways. There is a ford over the Ramisi river, which is reached at 40 miles from Likoni. The water is chest high at moderate tide. The banks are steep and awkward, and the river is 30 yds. wide. Two miles beyond the Ramisi river a branch track leads south to Shimoni. Near the Makwembi river (mile 47) the road leads through patches of dense jungle and swamp.

Mazareni is reached at mile 50. Two miles farther on the road enters a mangrove swamp, 300 yds. across, and knee-deep at high tide. The Mwema river is crossed by a ford. From here to the Uмба river there is no obstacle in the dry season, but there are short stretches of swamp very difficult after wet weather.

It is a four days' journey overland by this route from Mombasa to Tanga in Tanganyika Territory. In the Vanga district, the extreme south-eastern part of British East Africa, there is much elephant grass and dense jungle with mangrove swamps and many small swampy streams. There are no roads, only footpaths passable by porter transport. Except in the Ramisi river there is no absolutely reliable water in the dry season, though it can generally be obtained by digging in the river beds, and is usually found, at least in pools, in the Uмба and Mwema rivers. The Ramisi never runs dry and is always drinkable, though the water is slightly brackish. In April it floods extensively. Driftwood can be seen in the dry season 20 ft. above the level of the river. The two chief centres in this south-eastern part are Gazi and Mwele. The former is an old Arab town on the coast, the latter a hill which forms the southern termination of the Shimba range (see Descriptive Geography). A well-defined and much used bush track runs from Gazi to Mwele, 18 miles, in a north-west direction. There is 'fly' all the way. From Mwele, where there is unlimited water and good camping-ground, a track runs to Mareni, and thence south-east to Vanga. Another track, much overgrown with bush, leads south-west from Mwele to Mount Jombo.

A bush track, much used by natives, goes from Mwele, first west and then north to Samburu station, at mile 40 on the Uganda Railway. The total distance is about 56 miles. The track keeps well away from the Shimba hills to the west, and water is scarce except in the rains. As far as Ngurangani, 20 miles due south of Samburu, it is fly infested.

In the dry season, instead of following the track down the coast to Gazi and Shimoni, it is possible to strike across

country and follow the crest of the Shimba hills to Mwele. Even in the dry season there is much boggy ground. There is an abundance of permanent water on the Shimba hills. This route goes through very beautiful country. A motor road to Port Reitz, made while the Mombasa water works were being constructed, is now overgrown.

North of Mombasa a cleared track runs to Malindi, a distance of 73 miles, and is continued thence, a further 4 miles, to the ferry over the Sabaki. From here a native track runs on to Kipini, through very bad swampy country. Between Mombasa and Malindi there are ferries at Takaungu and Kilifi Creek. The loose sandy nature of the soil makes going difficult. Motors can go over it, though they could not negotiate the creeks without special boats to take them across. The road is not, however, usable by vehicles generally. It is possible to bicycle along it. In the Malindi district the grass and scrub have an extraordinarily vigorous growth, and the track is in constant need of clearing.

The Giriama country is best reached from Mombasa by rail to Mazeras at mile 10 on the Uganda line. From Mazeras there is a strip of open road, 3 miles in length, to Rabai, whence a native track leads to Mtanganyiko at the head of Kilifi Creek, and thence through northern Giriama to Mount Mangea and the Sabaki river. In the Giriama country, which begins 5 miles north of Rabai, water itself is not difficult to obtain, but in many places is so charged with salt that it cannot be used for cooking or drinking. In the dry season water must be carried, and it is best to travel by night. In northern Giriama there is no permanent water except at Vitangeni, where there are always pools in the river. From the C.M.S. station at Lake Jilore, which is now dry, there is a road to Malindi, a distance of 16 miles.

From the mouth of the Sabaki to the mouth of the Tana is nearly 50 miles. It is fairly good going along the west or right bank of the Tana river, keeping to the level sandy plain outside the thick forest belt which borders the stream. Nearly all the villages are on the right bank, and there are

frequent malkas, or watering places, where the sandy 'bara' comes right down to the river. Communication between the Tana villages is carried on by canoe. From Kipini (see above), the port at the mouth of the Ozi, a good track runs north-west for 19 miles to Witu. Lamu is reached from Witu by road to Mkonumbi, 22 miles ENE., through a fly-infested district and thence by dhow. Communication between Lamu and Kismayu is almost entirely by sea. There is a native track overland by which the journey takes about 8 days.

THE TARU DESERT

The 'nyika' between the Sabaki river and the southern frontier is known as the Taru desert. It is roadless and practically uninhabited, and water is scarce. Before the construction of the railway this broad desert belt was the chief hindrance to communication between the fertile strip of country along the coast and the highlands of the interior. The old caravan route across the Taru desert has, of course, been superseded by the Uganda Railway, which, however, follows it very closely, and runs at an average distance of 50 miles from the southern frontier.

Ten miles west of Samburu, just to the south of the railway is Taru hill with five pools of permanent water.

From Mackinnon Road, at mile 60 on the railway, a fairly defined bush path runs south-west for 17 miles to the hill of Pika Pika. The time required is about 6 hours. There is permanent water on the north face of Pika Pika, apparently a weak spring. There is also water to the east of the hill, but it is unfit to drink. From Pika Pika, a fairly well-defined track leads south-east to Kilibasi hill, on the eastern side of which there is permanent water. Kilibasi lies 13 miles west of the track from Mwele to Samburu (see above). From Kilibasi SSE. to Marení is 30 miles. There is no track and no water. To the north and east of Kilibasi is black cotton soil, which makes bad going in wet weather.

The long ridge of Maungu hill rises immediately to the south of Maungu station, at mile 80 on the railway. There

are some small unreliable water holes upon it. A track runs south from here to the hill of Kasigau, a distance of 20 miles, and easy going. Kasigau (see Descriptive Geography) rises very precipitously from the plain and is encircled by a native track. In the early morning it is often covered with fog especially during the rains. There is plenty of water on the western, southern, and eastern slopes, and 4,000 men can be watered daily except in very dry weather. The streams from the hill disappear on reaching the plain. Lake Jipe, 54 miles WNW., can be reached from here, passing through Kinsharo, 26 miles from Kasigau. The presence of elephants show that water must exist, but none has yet been found. During and shortly after the rains there is a great deal of surface water along the elephant tracks running from Kinsharo to the north end of Lake Jipe. The Taru desert can also be traversed by following the Sabaki river, which never quite runs dry, to the junction of the Athi and Tsavo at Tsavo.

THE VOI-TAVETA ROAD, AND CONNECTED TRACKS

From Voi, at mile 100 on the Uganda line, a road runs west to Taveta, and thence, between the northern Pare mountains and the southern slopes of Kilimanjaro, to Moshi, a distance of 104 miles.

It is an old caravan route, by which the German settlers in the Moshi district used to import their supplies, prior to the completion of the Usambara railway, and is still an important avenue of trade. It will, however, be largely superseded when the military railway constructed during the war from Voi to Taveta is opened for general traffic, and extended to join the Usambara line at New Moshi (see volume on African Railways). In the war the Voi-Taveta road was much used for military purposes. It is not metalled, but is good practically throughout. Motors and lorries of from 2 to 3 tons can go over it fairly easily.

The road runs at first south-west to the south-eastern end of the Bura (Dabida) hills. At mile 8 the Voi river is crossed by a suspension bridge. From here a track leads south-east

to Sagalla on the western slopes of the Ndara hills, to which there is also a track, 10 miles in length, from Voi. At mile 17, the Mwatate river is crossed by a bridge, and a track runs north to Mbale. There is running water in the Mwatate to 4 miles south of the bridge. A track follows the river southwards to Kasigau (44 miles). From Mwatate the road continues in a westerly direction south of the Bura hills. At Bura (21 miles) there are two streams. There is running water in the Bura river from where the road crosses it to 8 miles to the south, and considerably farther after heavy rains. From Bura the road ascends by easy gradients through fairly dense bush to the Serengeti plains (see Descriptive Geography). At mile 38 is the hill of Maktau, an outlier of the Bura hills, with a few rock pools, in which there is water after the rains. A bush-cut path runs from here northwards to Mzima on the Tsavo river, a distance of 36 miles. There is no water. For the first 15 miles this path is passable by wagons, after that only by mules, and is very bad going. West of Maktau the plains become more open, consisting of rolling downs. The ridges run north and south, the tops being bush-covered, and the intervening valleys open and almost treeless.

Mbuyuni, 51 miles from Voi, situated on a low ridge, is very healthy, and would be an ideal camp, but for the absence of permanent water. There is a good deal of surface water, which sometimes lasts as long as two or three months after the rains. North of Mbuyuni there is thick bush, but to the south it is more open. It is quite possible in the dry weather to motor across the plains to Lake Jipe, 22 miles to the south-west, and thence southwards to the gap between the south and middle Pare mountains, through which Zame (Same) on the Usambara line can be reached. Going is easy all the way, but except in Lake Jipe (see below) there is no water, and that is only drinkable after the rains.

At mile 59 from Voi, Njoro (Lanjoro) drift is crossed. There is a bridge across the drift, but the approach to it from the west is bad, the only really difficult part of the road.

The watercourse is 20 ft. deep, but there is no water except in the rains. Six miles south of the bridge there is a permanent spring of slightly saline water. A track runs northwards from Njoro to the Ziwani swamp (see below), passable by wheeled transport.

Saleita hill, which rises 130 ft. above the plain, is 62 miles from Voi. The road runs to the south of the hill on which there is no water. To north and south the bush is very dense. For the next 8 miles the road descends to the Lumi river. It is fairly easy going, but a bad fly-belt. The river, which is 30 yds. wide, with banks 15 ft. high, is crossed by a bridge. There is a belt of forest and swampy ground on either side. The Lumi river marks the western limit of the Serengeti plains.

Taveta, where there is a large spring is reached $71\frac{1}{2}$ miles from Voi.

From Taveta it is a two days' march to Moshi. The numerous streams which descend from the southern slopes of Kilimanjaro are all bridged. Three miles west of Taveta the road crosses the frontier between Latema hill to the south, and Kilimanjaro to the north. A track branches off from Taveta to the south-west, and crossing the Kitowo hills by the Latema-Reata nek runs to Kahe on the Usambara line, a distance of 20 miles. There is plenty of water, but the track is rough, and almost certainly impassable by motors. Lake Jipe, 16 miles to the south-east, can be reached from Taveta in about 4 hours.

Lake Chala, which is 1,400 ft. above Taveta, on a spur of Kilimanjaro, is $1\frac{1}{2}$ hours to the north. The water is good, but not easy to approach. The only access is on the western side by a steep path 300 ft. down to the water.

Another route to Taveta starts from Tsavo station at mile 130 on the railway. For the first 38 miles, as far as Mzima, where the path from Maktau comes in (see above), it is fit for motors, but the river Tsavo has to be crossed three times. The track keeps mainly to the south side. The Tsavo is a permanent stream, and there is never less than from 3 to 5 ft. of water.

At mile $31\frac{1}{2}$ is Crater Camp, so called from an isolated crater on the north bank. The ford across the river here is usually $2\frac{1}{2}$ ft. deep. At mile 38 the Mzima river joins the Tsavo on the north bank. It has very good clear water. Beyond this there is a mere bush track fit for donkeys and mules. 'German Ford', at mile 49, is easy to cross, having a good hard bottom, and generally only 9 inches of water. Here the track branches. One branch continues into Tanganyika Territory by Rombo and Marunga to Old Moshi, 103 miles from Tsavo. The Rombo river is fordable anywhere. There is plenty of water, and no fly. From Marunga it is said to become fit for motors. The other branch runs south-west for 32 miles to Taveta. There are no waterless stretches, but there is fly throughout. Sixteen miles from German Ford is the northern end of the Ziواني swamp, one of the sources of the Tsavo. Water is plentiful and permanent. The track passes down the eastern side of the swamp, the southern end of which is about 12 miles from Taveta. The track crosses the Lumi river, and 5 miles farther on passes the foot of Chala hill (see above).

On the north side of the Tsavo river, the ascent to the highlands begins, and the gradient becomes steeper.

There are no other communications south and west of the Uganda Railway until Nairobi is reached, other than the Magadi Railway which branches off at mile 280 (see volume on African Railways).

Water is very scarce.

Plentiful and permanent water is found at a place called Chambui, 5 miles north-west of Ndawe hill, and 10 miles south-west of Kenani station, at mile 145 on the Uganda line.

No water lies on the Chyulu hills, the rock being porous.

From Mtito Andei station, at mile 160 on the Uganda line, 'German Ford' on the Tsavo can be reached by a track not much used. At Mweani, the source of the Mtito Andei river, there is a plentiful supply of permanent water.

Immediately north of Kilimanjaro is a swampy plain extending eastwards to the Chyulu range, with several large

shallow sheets of water. The water in them is saline, and is only drinkable after the rains, when the whole country is water-logged. In the dry season there is scarcely any water.

Note on Lake Jipe and the Pare Mountains

The frontier passes up the middle of Lake Jipe, which is surrounded with a broad belt of papyrus swamp. As already stated it can be reached from Mbuyuni by motor in the dry season across the Serengeti plains, and from Taveta in about 4 hours. There is only one access to the water on the east side. This is at Lambewa, to the north of the hill, Vilima Viwili. It is extremely dangerous to enter the papyrus swamp, which is infested with tsetse fly, while the lake swarms with crocodiles. An approach to the water has been cut through the papyrus on the south-west side, 1 mile north of the southern end, where the water is said to be good. Elsewhere it is only drinkable after the rains.

The Usambara and Pare mountains run for about 130 miles parallel with the frontier in a NNW. and SSE. direction. The Usambara Railway from New Moshi to Tanga lies immediately to the west.

There is a gap between the Usambara and Pare mountains known as the Gonya Gap, through which the Mkomazi river runs south-east to join the Pangani. It is narrow, swampy, and dangerous.

A low saddle connects the southern and middle Pare mountains. It is practicable for motors in the dry season. This is the route from Mbuyuni to Same on the Usambara line.

A similar low saddle connects the middle and northern Pare mountains forming a pass known as the Ngulu Gap. From Njata (4 hours from the south end of Lake Jipe), a regular track, 4 ft. wide, has been cut through the Ngulu Gap to the Usambara Railway. There is water 1 hour west of Njata in a stream at the foot of the hills. There is ample water in the pass itself.

The low plains to the east of the Pare mountains are infested with tsetse fly.

EASTERN HIGHLANDS

The chief centres of communication in the eastern highlands are Nairobi, Machakos, Fort Hall, Rumuruti, and Meru.

Nairobi is situated at mile 325 on the Uganda railway.

The three principal roads from Nairobi are : (i) south to Kajiado and Mount Erok, (ii) north-east to Fort Hall, and (iii) north-west to Naivasha. The last will be described in connexion with the Rift Valley.

A road, made since the war, runs south from Nairobi across the Athi plains to Kajiado at mile 26 on the Magadi railway, and continues thence to Mount Erok on the frontier, and beyond this by Mount Longido to Arusha and New Moshi. It is passable by motors except in very wet weather, and by ox-wagons at all times. After heavy rains the cotton-soil of the Athi and Kapiti plains becomes waterlogged. In the dry season it takes $2\frac{1}{2}$ hours to go by motor from Nairobi to Kajiado, a distance of 42 miles. The Athi river is crossed by a ford, $8\frac{1}{2}$ miles south of Nairobi. At mile 17 the pipe-line, which brings water from Ngong hill to Kajiado, joins the road. The Senya river is reached at mile 30. There is plentiful water in pools in the bed of the river, east and west of the road. One pool is reserved by the Masai for drinking purposes.

From Kajiado southwards there is no water for 20 miles till the Bissel river is reached, 62 miles from Nairobi. The water is drinkable but not good. Six miles farther south the road crosses the Ol Emperasha Hills. There are permanent springs on the eastern slopes along which there is an alternative track. Ol Ekunoni camp is situated on the hills 28 miles from Kajiado. The nearest spring is two miles to the east, and gives 2 gallons per minute in dry weather. After crossing the hills the road runs south over the gently undulating country of the Matumbato Masai plains, to Kidongai camp, at mile $88\frac{1}{2}$ from Nairobi. The camp is situated on the east side of Mount Erok (see Descriptive Geography), at an altitude of 4,300 ft. The Kidongai river contains excellent water. Numerous perennial springs descend from Mount Erok, and

the water is safe from pollution. There are few ticks or flies. Motors can go almost anywhere in this part of the Masai plains.

From Kidongai the road curves south-east round the slopes of Mount Erok over level country to the Katanga river, which it crosses at mile 98. The water is clean and good. From here it passes across the frontier to Mount Longido, 11 miles south of Mount Erok. Arusha which is distant 62 miles due south of Longido can be reached from here by a road fit for motors throughout, except in very rainy weather. It is fly free. The road from Longido to NewMoshi, 196 miles from Nairobi, is difficult in places, especially in wet weather.

The road from Nairobi to Fort Hall is an earth-made road, 58 miles in length, with bridges over all the rivers. As far as Chania bridge, about half way, the road is excellent, and can be used by motors at all seasons. There is a fine stone bridge across the Chania river. The Blue Posts Hotel, built of grass, is situated on the narrow strip of land between the Chania and Thika rivers. From here to Fort Hall little has been done to improve the surface of the road, and in the rains it becomes very difficult. The red clay of the Kikuyu plateau is hard when dry, but becomes tenaciously sticky in wet weather.

About 15 miles out of Nairobi, a branch road runs off the Fort Hall road into the settled area along the Ruiru river. The bridges are good but the road is bad especially the parts leading down to and away from the bridges. With very little trouble and expense this road could be made a really good one. At present bullock-wagons frequently break down on it. Twenty-two miles from Nairobi a branch road runs south-east to Juja, a distance of about 9 miles, whence there is a track to Machakos.

A road, which is motorable in the dry weather, runs from Nairobi to Machakos a distance of 42 miles. The journey there and back can be accomplished in a day. Going from Nairobi the road follows the railway line, south-east, for the first 20 miles to Athi plains station, and then strikes ESE. to the south of the Lukenia and Mua hills. Three miles beyond Athi plains station the road crosses the stony Athi on a bridge

of four spans of 20 ft. each, built in 1913. It is an excellent road as far as the Mua hills, after which it becomes very hilly.

Besides the longer roads, there are several short roads in the neighbourhood. The Nairobi-Ngong road is a made earth road, 10 miles in length. Half-way there is a branch to Dagoreti and Kikuyu railway station. Another road goes to Limoru railway station, and a third runs north to Kiambu, whence there are roads WNW. to Limoru, and ENE. to the Nairobi-Fort Hall road (3 miles). From Limoru a cart-track goes to Kijabe railway station. This last is very dangerous in the wet weather. A fourth road connects Nairobi with Juja, 24 miles to the east. A tramway with a 2-ft. gauge, runs from Nairobi to the military camp at Mbagathi, a distance of 8 miles.

From Kibwezi at mile 190 on the Uganda line, a track runs to Machakos, 80 miles to the north-west. Passing to the east of Bwinzau hill, it goes to Makindu station, at mile 205 on the railway, and thence north-west round the western side of Nzaoi and across the Keite river to Machakos.

The direct trade route from the railway to Machakos is from Kapiti plains station at mile 290. This road is 20 miles in length and fit for motors.

A good caravan-road but not passable by motors connects Machakos with Kitui. The Athi river is crossed 31 miles east of Machakos by a ford. There is a pulley line with a basket which must be used in wet weather. After leaving the Athi there is no more water in the dry season. The total distance to Kitui is about 50 miles.

A very fair road connects Fort Hall with Karuris, 9 miles to the west, on the slopes of the Aberdare mountains. This was cut through by the chief Karuri.

A road, fit for motors, now runs the whole way round Mount Kenya. From Fort Hall, Meru, on the north-eastern slopes of the mountain, can be reached either by way of Nyeri, to the west and north by Mount Kenya, or through Embu to the south and east. The former route is a little the shorter ; but there is not much difference. A great deal has been done

recently in this district to improve the roads. A few years ago there was only a path to the north of Kenya, crossing altitudes up to 10,000 ft., and entailing steep and arduous climbs.

The road from Fort Hall to Nyeri was made by the Public Works Department. It is a good road, 50 miles in length, with good bridges over all the streams, passable by 3-ton lorries. A little while ago it was a dangerous winding road with very steep gradients. The country through which it passes consists of a succession of steep-sided valleys, separated by narrow ridges. The streams are large and perennial. From Nyeri the road is continued northwards through the farms of the West Kenya district, where formerly only a wagon track existed. It runs past the north-western end of Kenya to the southern end of Loldaika (see Descriptive Geography) where it turns east to Meru. The country to the north of Kenya is not so well watered as on the other sides of the mountain, but the longest waterless interval is not more than 12 miles, and generally the intervals are considerably shorter.

The road round east side of Kenya from Fort Hall to Meru runs north-east through Embu to Chaka, and then north. It has been made as good a road as that to the west of Kenya, and all the streams are bridged. There is a fine suspension bridge across the Tana (Sagana) to the east of Fort Hall. The Inyamindi river is spanned by a natural bridge of rock over which the road passes. The country to the south and east of Kenya consists of a succession of very deep and precipitous ravines, and it is no small feat to have made a road through it passable for motors.

At Nyeri a track comes in from Naivasha (see below, Rift Valley), and another from Rumuruti, the Government station on the Guaso Narok to the north-west. The journey from Nyeri to Rumuruti is 63 miles. The track crosses the upper Guaso Nyiro at 18 miles from Nyeri, and the Ngorongobit river, 12 miles farther on. This latter river may be taken as the southern limit of the great Laikipia plateau (see Descriptive Geography). As far as the Ngorongobit the track crosses numerous deep valleys, but north of this river the country

becomes flatter and drier, and the streams smaller. The Equator is passed at mile 43. Just to the north of this the hill Sirima rises to the east of the track.

At Rumuruti tracks come in from Gilgil and Baringo in the Rift Valley.

The march from Rumuruti north-east to Archer's Post (see below) is first along the left bank of the Guaso Narok to the northern end of the Pes swamp, and then crossing to the right bank. The country is for the most part short grass, and the water in the river is sweet and clear. There is a good deal of thick bush where the Guaso Narok joins the Guaso Nyiro, 22 miles from Rumuruti. Thence, it is 11 miles northwards to the commencement of the eastward bend of the Guaso Nyiro, which can be followed along the southern bank to the ford opposite Archer's Post. There is no path, only animal tracks occasionally.

Several roads meet at Meru, in addition to those from Nyeri and Embu. A good motorable road, 46 miles in length, runs north to the ford opposite Archer's Post, whence the journey across the desert to Marsabit and Abyssinia begins. It takes about $2\frac{1}{2}$ hours to motor to Archer's Post from Meru. A road 17 miles in length runs north-east to Dominuki's, and is continued thence round the Jombene (Nyambeni) mountains (see Descriptive Geography). Another road runs through Zaichu, which is situated on the foothills south of the Jombene mountains, to Garrba Tula, the new Government station, at the head of the watercourse, which contains permanent water, to about 12 miles south of the Lorian swamp. It is intended to run this road through to Wajheir (see below, Jubaland). A fourth road goes south-east from Meru through the Theraka country to the Tana. There is at present no communication down the Tana.

THE RIFT VALLEY AND WESTERN HIGHLANDS

A motor road goes from Nairobi to the soda works on Lake Magadi, 60 miles to the south-west. The journey takes about $6\frac{1}{2}$ hours.

From Magadi soda works to Arusha in Tanganyika Territory is a march of $5\frac{1}{2}$ days. The route goes due south for 2 hours, then south-west across the lake for 1 hour, then west for another hour, after which it turns south again to the northern end of Mount Shombole, and passes round the western side of the mountain to the mouth of the Guaso Nyiro, on the northern shore of Lake Natron, where the boundary post is reached, 24 miles from Magadi. From here the track goes down the east side of Lake Natron past Mount Gelei and Mount Kitumbein, and then south-east to Arusha. Twigg's Post, which is distant 35 miles from Magadi Soda Works, on the plateau above the western escarpment, can be reached in 13 hours. The road from Magadi to Bagasi river is fit for pack transport ; from Bagasi river to Twigg's Post for porters only. Natural water is only obtainable from the Guaso Nyiro (mile 18), the Bagasi river, and at Twigg's post. The march over the lake should be done at night, the soda affecting lips and eyes, and causing intense thirst. After rain the lake and the Guaso Nyiro are impassable. The ascent of the escarpment is very difficult.

Another descent into the Rift valley from Nairobi is by the road to Ngong (see above), and thence north to Ngong hill by a very steep and precipitous descent into the valley of the Kedong.

The main route from Nairobi into the Rift valley is by the old caravan road, which is known, to the west of Nairobi, as Sclater's Road. This was originally constructed by Capt. Sclater, R.E., who also made the first survey of the Uganda Railway. Sclater's Road runs from Nairobi to Mumias and on to Jinja in Uganda. From Nairobi the road goes through Dagoreti to Kikuyu railway station, and thence by a circuitous descent, in a general NNW. direction, to the foot of Kijabe hill, on the floor of the Rift valley. It has been cleared and improved, and is now reported motorable from Nairobi to Naivasha, a distance of 52 miles.

The following branches take off from this road :

(i) A motor road, recently constructed, runs south-west

from Kijabe across the Rift valley, and up the western escarpment, the slope of which is comparatively gentle, to Ngare Narok, the head-quarters of the Masai Reserve, and thence to Mara Post, on the river of that name, in the southern Masai Reserve.

(ii) From Naivasha a good road follows the western side of the lake, through the Endabibi plain, with a length of 17 miles.

(iii) A road of 5 miles goes from Naivasha to the Government farm on the east side of the lake.

(iv) A Government-made road, not suitable for wheeled traffic, runs from Naivasha to Nyeri, a distance of 45 miles, crossing the Kinangop plateau and the Aberdare range. The track through the bamboo forest on the Aberdares is pitted with enormous holes. This route, which goes through varied and beautiful country, might be greatly improved and even made motorable, when it would become a main avenue of communication, connecting the two flourishing districts of Naivasha and West Kenya.

In the neighbourhood of Naivasha motors can go almost anywhere, as the whole country is like a vast lawn, the only danger being pig-holes.

An excellent motor road connects Naivasha with Nakuru, a distance of 40 miles, and continues beyond Nakuru to the Molo river. From Naivasha the road runs NNW. to Gilgil (18 miles), and thence along the east side of Lake Elmenteita to Nakuru. Four miles north-west of the northern end of Lake Elmenteita a branch road, 10 miles in length, runs south to Elmenteita railway station. Nakuru is about 92 miles from Nairobi by road, and 120 by railway, the Uganda line being compelled to make a long détour to avoid the swamps at the south end of Lake Elmenteita. There are 23 waterless miles between Nakuru and the Molo river.

From Gilgil there is a track, 65 miles in length, to Rumuruti (see above). The journey takes about 4 days. After passing through the Gilgil farms, and crossing the Morendat river, the track ascends to the plains known as Angatu Pus (see

Descriptive Geography). It passes along the eastern side of Lake Olbolossot, and round the northern end of the Aberdares.

A road goes north from Nakuru to Lake Solai, about 24 miles in length, and there is also a track to Rumuruti, a distance of 67 miles. The route from Nakuru to Baringo follows the main road to Molo river, and continues thence by a good caravan road, but not fit for motors. Since the Government station has been removed from Baringo this road is not much used. A new post has been made at Kabarnet on the summit of Kamasia. A track fit for pack transport has been made up to it.

Slater's Road continues from Nakuru to Eldama ravine, a distance of about 37 miles. From the ravine station it is a 4 days' journey along Slater's Road through forest with open glades to Kapsabet. A new road has been made from here southwards to the edge of the southern face of the Nandi escarpment. The descent is very tortuous and steep, and is only possible for human portage. There is a good camp at the bottom, whence the road continues to Kibigori, at mile 560 on the Uganda Railway.

The old Slater's Road, which runs westward from Kapsabet, descends the western face of the Nandi escarpment. Eleven miles from Kapsabet there is a branch track southwest to Kaimosi (see below). It is a 4 days' journey by this route from Kapsabet through Kakamega to Mumias.

From Londiani station, at mile 500 on the Uganda line, a road starts northwards. About 7 miles from Londiani it branches. One road runs north-east to Eldama ravine station, which is 21 miles distant from the railway. The other road goes to Eldoret on the Uasin Gishu plateau, and thence to Sergoit. About 23 miles from Londiani it joins Slater's Road, which it follows for some miles, before branching off to the north. At present this road is unmetalled and in a very bad condition, though it forms the only means of communication between the railway and the block of 600 farms on the Uasin Gishu plateau. The total distance to Eldoret is 75 miles. Burnt Forest inn, 45 miles from Londiani, forms

a half-way house. A little to the south of this is a particularly bad piece of the road, known as the 'Red Sea', which in the rains is a morass of thick red mud. There is a bridge across the Sosian river south of Eldoret. The journey from Londiani station to Eldoret takes 3 days, and to Sergoit, which is 25 miles farther to the north, 5 days. The best means of transport is ox-wagon. The projected railway from Nakuru to Mumias will pass through Eldoret.

From Eldoret there is a track northwards through the Trans-Nzoia district, and then through the Marich Pass to the Suk plains, on the floor of the Rift valley, and so to Kacheliba, the Government post on the left bank of the Turkwel river in Uganda. From here the track continues to Maroto Post in the Turkana country. It is fit for wheeled transport the whole way from Eldoret to Maroto Post in Uganda. There is a temporary bridge across the Nzoia river. There is no bridge over the Turkwel, which is crossed by a ford.

From Kacheliba Lake Rudolf is reached down the Turkwel river. At the bend of the Turkwel river is the post of Lodwar, on the Uganda side, where a track comes in from Maroto.

A bad donkey track crosses the Suk plains from Kacheliba to the new post of Kerio, which is situated on the left bank of the river of that name, due east of Mount Laterok. There is no permanent water on the Suk plains except in the Kerut and Kerio rivers.

There is a track from Kacheliba to Mumias (see below). The track from the now abandoned post of Baringo to Kerio Post, a distance of about 115 miles, crosses the Kito Pass, between Kamasia and its northern extension the Taiti hills, and descends to the Cheb-Karat, a tributary of the Kerio, where water can always be obtained by digging. From here northwards along the right bank of the Kerio is easy flat walking.

South of the Uganda Railway, and between it and the southern frontier, there are hardly any communications.

Mention has already been made of the road from Kijabe to Mara Post. From Lumbwa, at mile 520, on the Uganda line, a road runs 23 miles south-west to Kericho. It is quite a good road, but winding and hilly. The farmers in the Sotik country have, with Government aid, constructed a wagon road to Kericho. This runs from the borders of the Chepalungu Forest, 50 miles south of Kericho, through broken and hilly country.

THE LAKE DISTRICT

From Kisumu, at the head of the Kavirondo Gulf, the terminus of the Uganda Railway, and the principal lake port, a road runs NNW. to Mumias, a distance of 48 miles. It is in fair condition, and carries more wheeled traffic than any other road in the Protectorate. There is a bridge over the Yalu river.

From Mumias two roads go to Uganda. One runs ENE. to Busia, a total distance of 30 miles. This is part of Sclater's Road. It is carried over the Nzoia, one mile from Mumias, by a steel suspension bridge. The width of roadway is 12 ft., and it will take a 10-ton steam roller. The other road is a track, not fit for wheeled traffic. It runs north by west from Mumias to the frontier, a distance of 32 miles, and thence to Mbale in Bukedi, 27 miles farther on.

A track runs NNE. from Mumias through the Kitosh country, and along the south-eastern and eastern slopes of Mount Elgon to the post of Kacheliba on the Turkwel river (see above). There is a good road, 26 miles in length, from Kisumu, north-east to Kaimosi, whence a track connects with Sclater's Road from Kopsabet to Mumias.

In South Kavirondo there are two first-class roads with bridges and culverts. One runs from Homa Bay, on the southern shore of the Kavirondo Gulf, to Kisii, a distance of 27 miles, passing Languah at mile 9. The other goes from Kendu, also on the southern shore of the Kavirondo Gulf, east of Homa Bay, to Kisii, a distance of about 20 miles. These two roads are fit for any kind of transport. Communication between Kisumu and Homa Bay and Kendu is by boat (see Harbours).

From Homa Bay there is a track south-west to Karungu on the Victoria Nyanza, fit for pack transport.

The track from Karungu to Kisii, a distance of 39 miles, is fit for mules. Water is abundant, except during the first 9 miles, when the country is barren. After that it is fertile and well watered. The track crosses the Riana river, 16 miles west of Kisii. There is a native footbridge across it. In the dry weather it is easily fordable.

A track runs from Karungu in a south-easterly direction to Nregi, a distance of 49 miles. It keeps north of, and parallel to the southern frontier. The Kuja river is crossed 13 miles south-east of Karungu. In the rains it is impassable, and boats would have to be used. From the Kuja river to Ntende, at mile 30, the country is barren and waterless. After that water is plentiful.

NORTH FRONTIER PROVINCE AND JUBALAND

Details as to transport in these two provinces have already been given. The greater part of the North Frontier Province and Jubaland is a monotonous steppe-desert, hot, sandy, bush-covered, and badly watered. Much of the North Frontier Province consists of lava desert, large areas being strewn with jagged blocks of lava which make travelling exceedingly difficult. The question of water supply is of extreme importance, and, as already stated, camels are necessary for transport, though donkeys and mules can be used. Camels are found in large numbers in the North Frontier Province and North Jubaland. They are very delicate animals, and quickly die if overworked or brought into a cold damp locality. They are also subject to various diseases. 'Kut,' a swelling of the glands of the throat, wiped out some 40 per cent. of the Rendile camels in a single year. Many die from mange if this is not treated quickly, and numbers from various stomach troubles. The 'bal' fly is a great pest where these animals are concerned, and they cannot live in an infested area. There are several bushes which are poison to them, the best known of which is the 'gora', a shrub having a white

flower, similar in appearance to a passion flower. This plant is only poisonous to camels when it is flowering. Camels prefer saltish water. A Somali will never water his camel at a river, if possible, preferring to water them at wells, where the water is of a saltish nature. (For other details see above under 'Transport'.)

Archer's Post-Marsabit-Moyale

Archer's Post, on the northern bank of the Guaso Nyiro, has been largely superseded as a starting-place for Marsabit and Abyssinia by Meru, since the motor road was made from Nyeri to Loldaika, and round the northern side of Mount Kenia. A good motor road runs from Meru to the ford over the Guaso Nyiro opposite Archer's Post, a distance of 46 miles. At times a boat is required to make the crossing. A clearly defined wagon track runs nearly due north from Archer's Post for 131 miles to Marsabit. There is no water till Kauro is reached at mile 34. Here there is a dry khor, bordered by palm trees, in which water can be obtained by digging, but only in certain places, known to the natives. It is sometimes necessary to go to a depth of 15 ft. Immediately after the rain there is plenty of water in the khor. The constant occurrence of palm trees between Archer's Post and Kauro shows that water exists, but none has yet been found.

At Kinya, 3½ hours' march from Kauro, there is water in the bed of a khor, and again at Langaia (mile 52 from Archer's Post) there is water in a gully, 1 mile to the east of the road. The road near Langaia is very stony, and a little distance from Merille, which is reached at mile 66, the ground becomes strewn with lava blocks. Merille is on a khor running east and west. There are many palms, and plenty of brackish water can be obtained by digging from 2 to 3 ft. in the khor. Lasamis, at mile 80, is a desolate and unhealthy place, with some perennial waterholes of brackish water.

Another route from Archer's Post to Lasamis is along the Guaso Nyiro to the hill of Laishamunye, which rises on the

north bank of the river, a distance of 11 miles, and thence north to Serah over 30 waterless miles. At Serah there is good and plentiful water, which wells up from a clear spring in the dry river bed, and flows for about 50 yds. before being swallowed up in the sand. From Serah a bad and ill-defined road runs due east and then turns north to Turnong, 14 miles farther on, where a little water of poor quality can be obtained by digging. Fifteen miles from Turnong is Kwe, where the water is good, but probably not permanent. Lasamis is 18 miles NNW. of Kwe. There is no water except in the rains. This route avoids Kauro and Merille, which are scarcely less unhealthy than Lasamis. Bad types of fever may be caught at all these places.

From Lasamis to the edge of the Kaisut desert, a distance of 17 miles, the road is good, but there is no water for 38 miles, and a day's supply must be carried. There is a steady rise of 1,200 ft. all the way from Lasamis to Marsabit. It takes 14 hours to cross the Kaisut desert, and the journey is done in two 7-hour sections. Night marching is advisable to avoid the heat. At Ret (mile 119), on the outskirts of Marsabit, there is water in a dry river bed, $\frac{3}{4}$ mile south-east of the junction of road and watercourse. Forest and grass begin and the air becomes cooler. For the last 3 or 4 miles before the Crater Lake is reached, the road, which is very rough and stony, runs through Marsabit forest. The water in the lake is excellent, though before the Government station was formed there, it was much fouled by corpses, owing to vast herds of Rendile stock coming in from the desert to drink, and the weaker animals getting pushed into the water and drowned. The depth of the lake is very great, a weighted rope 400 ft. in length having failed to touch bottom. Mules thrive at Marsabit, but it is extremely unhealthy for camels. In the dry season the mountain is wrapped in fog up to 11 o'clock in the morning. Spirillum fever is endemic.

From Marsabit to Moyale is 165 miles. Four hours north of Marsabit Lake is Njoro Delamere. Like most of the water at Marsabit, except Ret and the Crater Lake, it is infested with

leeches, and must be strained. This is the last known water on the road to Moyale for over 80 miles. There is good going over grass land as far as Njoro Delamere. Five miles beyond this the conical hill of Horodera, the last outlier of Marsabit, is passed. This is a particularly bad spot for spirillum fever. Here the lava-strewn desert of Dido Gulgullo is entered. Camels are only able to do $2\frac{1}{2}$ miles an hour, and except in the rains there is neither water nor grazing. The lava ceases about $1\frac{1}{2}$ hours' march from Mount Turbi, which is plainly visible from Marsabit, being the only height to the north. The water on Turbi (mile 96 from Marsabit Lake) is not absolutely permanent, but there is generally plenty, especially in two rock pools in caves on the south-west side of the hill. After Turbi the going is good. The water at Lugga (mile 111 from Marsabit Lake) cannot be relied upon, but there is permanent water at Ramut (mile 125). From Ramut it is possible either to go north to Waiye, a distance of 6 miles, where there is a Boran village and permanent water underneath the Goro escarpment, and thence eastwards along the foot of the escarpment, or to cut across a little north of due east to Holali, 4 miles south of Moyale. The climb up the escarpment to Moyale is very steep and difficult, and is only to be attempted in daylight. Camels frequently fall down under their loads, and, if possible, donkeys and mules should be used. Moyale is healthy in dry weather, but in the rains it is most unhealthy. The water supply is permanent but insufficient. The best wells in the neighbourhood are at Jamok, about 4 miles from Moyale over the Abyssinian border. The only permanent water on the British side of the frontier between Lake Rudolf and the Webe Dawa is at Ramut, Holali, and Moyale. There are numerous wells along the escarpment a short distance on the Abyssinian side of the frontier.

Archer's Post-Loiyangolani

The track from Archer's Post to Loiyangolani, on Lake Rudolf, to the west of Mount Kulal, leaves the Marsabit road to the north of Kinya, and proceeds NNW. At Sendait,

12 miles from Kinya, and 52 miles from Archer's Post, there is good water in three wells. Senolait lies in a wide valley, in which there are some small precipitous kopjes. The wells are between the two southern kopjes. From here the track is almost indistinguishable for 11 miles to Lodermeru, where there are many wells of excellent water, south-west of a line of low kopjes. A good track from here follows the Irerr water-course to Irerr (mile 76 from Archer's Post), where there is good water from three wells. Both at Lodermeru and Irerr the grazing is poor. At Irerr a track comes in from Merille, 39 miles in length, passing Komatooni and Losidau, where there are wells of brackish water. The track is well marked from Irerr to Ngoronet, which lies under the Ndoto mountains, the north-western portion of Mathew Range. There is a good well and shade, but much poisonous camel bush. The road from here follows the Irerr water-course for $1\frac{1}{2}$ hours. At Ilaot (mile 104) there is a large pool near a detached hill to the north of the Ndoto mountains. One and a half hours from Ilaot a water-course is crossed. By following this into the hills, the Arsim, a permanent running stream, may be reached. A branch track follows the Arsim water-course, and then underneath a lava escarpment on the right hand, to Laipera, 46 miles to the north-east (see below). The road proceeds west and then north-west until it enters a gorge between the Ndoto mountains and Ol Donyo Mara. On emerging from this it turns north, and enters the Horr valley, between Ol Donyo Mara on the east and Ol Donyo Ngiri (Sil) on the west. The track through the Horr valley is good, and there is plenty of clear cold running water in two streams. At the first Horr stream (mile 137) tsetse fly is bad, and there is much poisonous camel bush. It is best to camp by the second Horr stream, where there is no fly. From here to Loiyangolani is 48 miles, first north towards Mount Kulal, and then NNW., over bad lava country, with no water all the way except in the rains. At mile 172 the track from Marsabit comes in, and shortly afterwards Lake Rudolf becomes visible, and the trees round Loiyangolani. Loiyangolani

has been abandoned as a station since the war. There is a proposal to open a new station in the Horr valley.

There are two routes from Marsabit westward to Loiyangolani: one by Gurgumwa to the north, the other by Laipera to the south. Both are bad going and very waterless. The distance by the first route is 123 miles, and by the second 116 miles. Two days water must be carried from Marsabit to Gurgumwa, where there is plentiful water in the river bed. From Gurgumwa five days water must be carried. Two days water must also be carried if going by Laipera, which lies underneath the great lava escarpment extending from Balessa southwards to the Arsim water-course (see Descriptive Geography). Laipera, as already stated, is 46 miles north-east of Ilaot, on the track from Archer's Post to Loiyangolani. A plentiful supply of water probably exists all along the escarpment. A track runs beneath it, with water-holes at intervals. The water at Laipera is fresh, but in most of the water-holes it is saltish. Karoli is 11 miles north-east of Laipera. Seventeen miles north of Karoli is Maidahad. Another 20 miles to the north-west is Maikona, with Kerauwi, about 8 miles farther on in the same direction. The line of water-holes finally ends at Kalacha, 17 miles north-west of Maikona. There is no water between Laipera and Loiyangolani.

Archer's Post—Malka Waja—Wajheir

A good serviceable track fit for bullock transport goes from Archer's Post as far as Marti plateau, a distance of about 80 miles. The tsetse fly on the Guaso Nyiro is most dangerous. The track runs in a general easterly direction following the line of the river about 300 yds. to the north. From mile 60 onwards the bush along the Guaso Nyiro becomes very dense, 500 to 1,000 yds. in breadth, and access to the water is difficult. Close to the southern end of Marti plateau is a government store at a place called Bulesa. From here onwards there is practically no communication. The ground between Marti plateau and the river is very rough, and from the eastern end

of the plateau to the Lorian swamp there is nothing but soft cotton soil and perfectly flat plains, impassable in wet weather. The Guaso Nyiro emerges from the Lorian swamp a narrow stream, 6 yds. broad and 1 ft. deep. It is infested with crocodiles. At Malka Waja, 6 miles south-east of the Lorian swamp there is a bridge, and it is intended to run a road through from Meru to Wajheir. At present the road from Meru by Zaichu, Garrba Tula, and the Ganale Gof, stops within 15 miles of the Lorian swamp (see above). The soil to the south east of the swamp is fine black dust in the dry weather, and an impassable morass in the rains. It will be a very difficult task to construct a road through this district. There are no trees, and no shade of any description.

From Malka Waja, Afmadu might be reached by following the Lak Dera, in which water could be obtained by digging. The country is flat on each side, and in the rains impassable. The 'bal' fly along the Lak Dera is fatal to camels, which should not be used on this route.

Wajheir is 88 miles north-east of Malka Waja by Lak Bogol, and Araba. There is no permanent water, and only rain pools at Lak Bogol about half way. A shorter route to Wajheir is by Arodima and Komoro Bulle.

Kismayu-Afmadu-Wajheir-Moyale

The distance from Kismayu to Moyale by Wajheir is about 430 miles. The whole route presents no great obstacles to the building of a railway. The Jubaland and Afmada Road Tramway starts from the pier at Kismayu and runs $3\frac{1}{2}$ miles north to Mbuyuni, along the sands and over the sand dunes. The tramway has a gauge of 2 ft. The average length of rail is 16 ft. The sleepers for the first 1,200 yds. are wooden, to enable them to resist corrosion from the sea air, and after that distance iron. The motor tractors used are converted Ford cars. Each tractor carries 1,000 lb. weight, and draws three trucks, which also carry 1,000 lb. weight each. The object of the tramway is to enable stores, &c. to be carried over the sandy stretch between Kismayu and Mbuyuni on

which loaded motor cars could not move. At Mbuyuni firm red earth is reached.

From Mbuyuni a road has been constructed to Afmadu, a distance of about 80 miles. In the dry weather the going for a Ford motor car is excellent along the whole length of the road, but in the rains a small part of the route, some 18 miles from Afmadu, becomes a muddy swamp and is impassable. This, however, can easily be rectified by a slight elevation of the road for a few hundred yards. At Afmadu water is plentiful from a well in the bed of the Lak Dera.

A good native track runs from Afmadu to Wajheir a distance not far short of 200 miles. In the dry weather there is no water to be found on it that can be absolutely relied upon, except at Eil Tuli, 170 miles north-west of Afmadu, but the springs here are impregnated with sulphur and the water is rejected even by camels. Water, however, can generally be found at Magar, 18 miles from Afmadu, in the bed of the Lak Dera at Golja (mile 27 from Afmadu), and in the bed of the Lak Jira at Jello (mile 35). During or shortly after the rains water is found in large 'pans' at frequent intervals along almost the whole of the route. The largest and best known are those at Dieff, 90 miles north-west of Afmadu. From Eil Tuli the track runs almost due west for 30 miles to Wajheir. There would be little difficulty in cutting a motor road from Afmadu to Wajheir, as the soil is firm and good, and water would probably be found by boring in many places. There are several hundred wells at Wajheir within an area of about 15 miles in diameter. They are sunk through limestone rock quite vertically to a depth of 40 to 50 ft., with a diameter of 3 ft., cut as symmetrically as with a drill. One theory is that they are geysers, and are not artificial. The water is unlimited and almost lukewarm.

A good native road connects Wajheir with Moyale, 140 to 150 miles to the north-west. The soil is firm, except between Korondil and Debel, where it is black cotton soil, and becomes muddy and sticky during the rains. These two places are 10 miles apart, being respectively 98 and 108 miles from

Wajheir. The only permanent water is at Buna (mile 82), where there is good water, but the supply is small in the dry season, and at Debel, where there are six wells, three and three, one hour's march apart. Near the southern wells there is poisonous camel bush. The wells are from 25 to 30 ft. deep. The water at Eil Las (mile 65) and at Korondil is not reliable. With the exception of the rise over the pass at Debel the route is practically flat until the Goro escarpment is reached near Badanna (mile 136). A road comes in here from Gaddaduma, 25 miles to the east (see below).

Water can be obtained from wells across the Abyssinian frontier half way up the escarpment. The road up to Moyale 5 miles north-west of Badanna, is very steep and rocky (see above).

Wajheir-Eil Wak-Moyale

From Wajheir a track runs north-east to Eil Wak. The distance is 118 miles, and the time required 4 to 6 days. In the dry weather there is no water except at Wajheir Bor, 14 hrs. from Wajheir. It is permanent, but aperient and not to be drunk unless absolutely necessary. For camels it is good.

There are about 100 wells at Eil Wak, spread over an area of 8 square miles, with an unlimited supply of water. Some of the wells are 50 ft. deep with many twists and turns, and the water has to be passed up by a chain of from 12 to 15 men. It is saline and purgative.

Numerous roads converge at Eil Wak, notably those from Moyale, Serenli, Gaddaduma, Eil Bode (on the Moyale-Dolo road) and Dolo.

There are two routes from Eil Wak to Moyale. One runs in a general north-west direction to Gaddaduma in Abyssinia, a distance of 115 miles, and then west to Badanna (see above). The exit from Gaddaduma is very steep and rocky, and should not be attempted at night. Water is scarce on this route, the wells at Gaddaduma being the first permanent and plentiful supply. The water at Takabba (mile 63) is soon exhausted. It takes 24 hrs. to fill 10 10-gallon tins. Four

miles north of Takabba are wells in which water lasts nearly to the end of the dry season. At Dandu (mile 91), besides a certain number of shallow and independable wells, there is often a good supply of water in a natural cistern half way up the hill.

The other route to Moyale runs west from Hoggasu well. At Buttalo, 37 hrs. from Eil Wak, the track passes through a narrow winding gorge in which are three wells, with a permanent but limited supply. The water on the far side of Ajao hill, 45 hrs. from Eil Wak, is both permanent and unlimited. This route joins the road from Wajheir to Moyale at Debel (see above).

Kismayu-Serenli

From Kismayu a good road runs to Gobwen on the Juba, a distance of about 9 miles to the north-east. That portion of the road which leads across the sandhills, about 1 mile in length, has been macadamized and made passable by motors. At Gobwen there is a ferry across the Juba to the Italian station of Giumbo. A road passable by motors connects Gobwen with Yonti, another 9 miles up the Juba. The going for the most part is not good, being very sandy.

The road made by the military from Yonti to Serenli is now overgrown and the bush on it needs recutting. Camels, however, can go anywhere. There are numerous 'dais' or swamps just outside the belt of forest and tropical vegetation along the Juba. Men must be sent to draw water from every dai, as they are all fly-infested, except Dai Salole, about 105 miles from Yonti, where it is safe to send camels to water during the dry season. There is a bad fly belt between Mfudu (mile 66) and Gelli (mile 93). The main watering-place on the Juba is Salagli, 140 miles upstream from Yonti. From here to Serenli there are bad belts of 'fly', but it is not continuous. The Aulihan country begins at Dakach (mile 162). Three miles south of Serenli is the Italian station of Bardera to which there is a ferry. An account of the Juba river as a navigable water-way from Gobwen to Bardera and

Serenli has already been given (see above, Waterways). About 6 miles north of Gelli (see above) a native path leads to the village of Nimaan on the Juba river. From here it is quite easy to carry food landed from steamers to the road.

Serenli-Eil Wak and Serenli-Dolo

From Serenli a track leads to Eil Wak (see above), 108 miles in length. There is permanent and plentiful water at Kaurao, 15 miles west of Serenli, in two springs, 500 yds. to the south of the road. The supply at Siddima (mile 30 from Serenli) is permanent, but scanty and brackish. There is no more water in the dry weather till Eik Wak is reached. The going is for the most part good, and night travelling easy.

A good track runs north from Serenli 18 miles to Dar, where there is plenty of permanent fresh water. At Dar the track branches. One track, very bad going, runs to Lolleshid on the Juba, 76 miles from Serenli. The other track is the main route from Serenli to Dolo and Lugh through the Marehan country. There is water, but of no very great amount, at Bagalti (mile 33 from Serenli), Denli (mile 41), and Dabli (mile 73). From Dabli a track goes to Lolleshid. About half way along this track, 20 miles ENE. of Dabli is Garre Baharre, where is the best known permanent water in the Marehan country. There are fine wells, 12 ft. deep, and many more could be dug. The water is slightly saline. The track from Serenli to Dolo continues through Humbali, where there is permanent water, to Arras. Here there are four wells. A track runs from Arras to the Juba opposite the Italian station of Lugh, 40 miles in length. Deshek Arras, 1½ hrs. from Arras, is a fair-sized swamp, which fills up with rain water and lasts for some months. Twenty-seven miles north of Arras, the Webe Dawa is reached at Unsi. Thence to Dolo is 15 miles by the Moyale-Dolo road.

Dolo-Moyale

The distance from Dolo to Moyale is approximately 270 miles. As far as Unsi the road follows the Webe Dawa very

closely, and after that runs a little distance to the south of the river. There are good watering-places at Malka Re (mile 22), and at Malka Dakka (mile 53). The latter is some distance from the road. Malka Sala (mile 68) is the last place at which water can be obtained from the Webe Dawa, and there is no more reliable water till Gaddaduma is reached. From Muddo Erri (mile 87) which stands at an altitude of 1,900 ft., the ground rises steadily the whole way to Banissa (mile 143), at an altitude of 3,500 ft. The water at Banissa is generally good and plentiful, but not absolutely reliable. From here there is a good road to Eil Bode (mile 148) where a track runs south to Eil Wak (see above). The track continues south-west parallel with the frontier to Golja (mile 161) and thence to Gadeir (mile 181). Water, which is probably not perennial, is found near Gara Gadeir. There is a most extensive view from this hill. Gaddaduma is reached at mile 222. The road from here to Moyale has already been described (see above).

CHAPTER X

ECONOMIC GEOGRAPHY

Coastal Belt—Nyika—Highlands and Rift Valley—Lake Zone—Jubaland and North Frontier Province—Mineral Resources.

THE total acreage of the Protectorate is estimated at 157,000,000 acres. Of these 76,500,000 lie in the desert or nyika zone, and 2,000,000 consist of forest-reserve. The remaining 78,500,000 acres may be regarded as open to development. Of this total 20,000,000 acres are in the native reserves, about 5,000,000 acres have already been alienated, and 2,579,200 acres have recently been surveyed and divided into 941 farms for allotment. Only 1,753,000 acres of this vast area are as yet under cultivation, the rest being bush and pasture.

Economically British East Africa falls into two sharply contrasted areas. Broadly speaking the line of division may be said to run from the Suk mountains to the north of Lake Baringo, and thence to the Guaso Nyiro at the point where it bends eastward to the north west of Kenya ; thence to the Lorian Swamp ; and thence to the coast north of the Lamu archipelago. The northern half, comprising the Turkana country, the North Frontier Province, and Jubaland, is with few exceptions of no economic value. The southern half, which will be considered first, is capable of great development. In agriculture and pasturage its possibilities are immense. Sisal, coffee, and wattle, in areas suited to them, mature more quickly in British East Africa than anywhere else. The mineral resources (considered separately below) of the Protectorate are poor. The southern half of the Protectorate may be divided into four zones : the Coastal Belt, the Nyika, the Highlands, and the Lake Zone.

COASTAL BELT

The coastal belt from Lamu to Vanga is primarily of value for the cultivation of coco-nut palms, and with careful development and ample capital a big industry is assured. The Lamu archipelago and the neighbourhood of Tiwi, to the south of Mombasa, are said to be the best localities. The climate is favourable, being fully tropical, with an average annual rainfall of from 45 to 50 in., and outside the range of hurricanes. The citrus fruits, limes, and a fine quality of orange can be grown. There is a certain amount of sisal, but it is dependable upon the weather, and the leaves are too fleshy to make its cultivation pay. Cotton is a possibility and has been developed to a certain extent on the Tana plains. The Lamu archipelago seems to present exactly the conditions required for the sea-islands variety. In the Vanga district, round the delta of the Umba river, there is a red soil over which black soil is carried by the river flood. This area would be most suitable for the cultivation of sugar cane, Indian corn, millet, cotton, tobacco, and rice. Some of these are already cultivated, but population is scarce, and large tracts are unoccupied. The climate here resembles that of Southern India. From all data at present to hand there are very large areas along the coast where sugar could be cultivated. It has been calculated that 241,000 acres of sugar land exist on the banks of the Tana. It is unfortunate that both the Vanga district and the country round the mouth of the Tana are dangerously unhealthy. Malindi district is a rich grain producing area, and there is also a certain amount of cotton. Among other specially fertile localities may be mentioned Witu and the Magarini Shambas.

Indigenous rubber grows about Mwele, round Takaungu, and in the forests of Arabuko (Sekoki) and Utwani. In the last named there is bastard ebony. The muddy creeks and inlets of the coast support dense forests of mangrove, especially in the districts of Vanga and Lamu. Fine, straight, tall spars are cut from the mangrove trees,

in which a considerable trade is done. The best kinds of mangrove bark produce 50 to 60 per cent. of tannin.

The coast belt is not suited to live-stock owing to the prevalence of fly.

THE NYIKA

The fertile strip of coast plain is separated from the highlands by a broad belt of nyika, known, to the south of the Sabaki, as the Taru desert, and between Voi and Taveta as the Serengeti plains. The red sandy soil with which it is covered is of great natural fertility, but it suffers from a poor rainfall and lack of water, and is mostly given over to scrub and bush. Several unsuccessful attempts have been made by the Uganda Railway Company to reach underground water. There are, however, very fertile strips along the rivers which traverse this region, the Tana, the Sabaki, and the Tsavo. A belt of alluvial soil from $\frac{1}{5}$ to 8 miles in width borders the Tana in its passage through the nyika, and irrigation from this river, should it ever be accomplished, would spread its alluvial silt over a wide area. There is much native cultivation along its banks, especially when the river forks to form the large island of Galanaba in the district of Korokoro. There are 20,000 acres of sugar land in the Sabaki valley and large areas suitable for cotton, but this river is not so promising as the Tana, as it is liable to sudden floods, and runs nearly dry in the hot season. In the southern part of this region, behind Vanga and Shimoni, the cultivable area extends much farther inland than it does to the north. The soil is a deep white alluvial sand, which to the south and east of Kilibasi hill is succeeded by black cotton soil.

The hills of the Teita district form another fertile area. There is an abundance of permanent water, and the hills and intervening valleys are well cultivated by the natives. In the Mwatate valley, which opens southwards from the Bura hills, there are large banana plantations. The southern hills of the Bura range have a greater rainfall than those farther to the north. There is a belt of rich alluvial land in the valley

of the Voi which is closely cultivated and gives splendid crops of millet, maize, and beans when the rains are plentiful. The summit of the Ndara range is fertile and well-watered arable land. In the centre of the plain that runs up from the Tsavo river to the highlands, between the Kyulu range to the south-west and the Athi river to the north-east, is the fertile district of Kibwezi. Here the underlying rock is lava which forms a very rich soil. A permanent stream issues from under an overlying mass of volcanic rock and provides an excellent water supply. The rainfall here and at Voi is longer and heavier than anywhere else between the coast belt and the highlands. There are considerable plantations round Kibwezi. The soil is suitable for citrus and sisal, and there are 2,300 acres of possible sugar land. Like the Voi district it is infested with fly and therefore impossible for live-stock. Owing to their unhealthiness the agricultural possibilities of these two districts are not likely to be fully exploited until the available land in the healthier and more promising highland zone has all been taken up.

THE HIGHLANDS AND RIFT VALLEY

The highlands are generally regarded as beginning at Kiu. The lower highland zone, lying between altitudes of from 4,000 to 5,500 ft. above sea-level consist mainly of wide open plains. This zone comprises the Athi and Kapiti plains to the east of the Rift valley, and the Loita plains to the west. These plains are considerably diminished in value as grazing grounds on account of the prevalence of ticks. The underlying rock is volcanic and they are covered with black cotton soil, characteristically treeless, and producing short rich grass. The rainfall is variable, the extremes being from 15 to 38 inches, and some parts, especially the Loita plains, experience severe droughts.

The hill country of the Machakos district is a great fruit-growing centre. A considerable amount of colonization is taking place on the Mua hills, where soil and climate are suitable for citrus and other fruits. It is also a great cattle

area. Round Ol Donyo Sabuk there are 2,900 acres of sugar land. The Machakos district is the most fertile and best watered part of the Ukamba province. In the Kitui district there is no permanent water except in the Athi and Tana rivers. Above 4,000 ft. there is fertility, owing to the drenching dews and wet mists which are condensed during the cool nights, and suffice to keep the crops fresh and growing during the heat of the day. Below the 4,000 ft. line is desiccated thorn bush with no leaf-bearing trees, and no villages.

The highland zone between the altitudes of 5,500 and 9,000 ft. is the most promising area for white settlement and farming. There are three chief types of soil, red clay, black cotton soil, and a yellowish grey loam ; the last is found only in the central portion of the Rift valley. (For a full description of these soils, see 'Geology'.) Though somewhat lacking in limes and phosphates all these soils are extremely fertile. The climate is cool and healthy, appropriate to many temperate crops. The average rainfall is 40 in. Already a wide range of both temperate and tropical plants have been found to do well, and many others are under experiment. The capabilities of the highlands as a whole are partly pastoral and partly agricultural, and mixed farming will probably turn out to be the most profitable way of developing the country. Comparatively slight differences of altitude, soil, and climate are here found to be of immense importance, Sheep thrive in one place and perish in another almost similar. Coffee will grow in some places at a high altitude, not in others. The profitable growing of sisal depends on a delicate combination of factors forming what is known as 'sisal ground'. The prevalent impression that much of the highlands is suitable for its cultivation is entirely misleading. It will not stand any variations of the requirements either in soil or in elevation. Doubtless there are considerable areas where it can be cultivated with success, but the selection of such areas should depend upon their examination by an accepted expert. Coffee is a far more general crop, and does

well between the altitudes of 5,000 and 7,000 ft. It requires an average good rainfall and appears to prefer the red clay soil which forms the general surface covering of the Kikuyu, Mau, and Uasin Gishu plateaux. The difficulty of knowing what will succeed and what will not almost compels settlers to take up a far larger area than they can possibly develop in order to obtain enough land suited to the crops in which they desire to specialize; there will also in most cases be a considerable amount of land with which nothing can be done.

The fertile Kikuyu district is mainly agricultural, and is well suited to coffee. The coffee-growing on the estates along the Ruiru river is an excellent example of what the country can do in the production of this crop. The natives are keen agriculturalists, and cultivate even the slopes of the constant succession of deep, steep-sided valleys which intersect the country. There is no doubt that the district has recently been deforested by them. When the cultivated soil in one clearing was gradually washed away, and turned into a pan of muram (see 'Geology'), the ground was deserted and a new clearing made. Over the deserted ground the grass returns and a few small trees spring up. The forest cannot spread over it again for the red clay has been removed. It is no longer fit for cultivation, and as pasture it is easily affected by drought on account of the thin unretentive nature of the soil. Since Kikuyu contains practically no level ground, and the slopes are steep the soil is certain to wash, if cleared altogether of its forest covering, and unless steps are taken it will in time lose its fertility. The retention of the hill tops in forest, and the alternation of strips of forest with tilled land on the hill slopes are most necessary measures. Forests also, as is well known, regulate the volume of springs and streams. The numerous waterfalls of Kikuyu are a great asset in the power supply of the country. Their value depends, however, on permanent equality of volume, and this in turn depends on the presence of forest.

Kikuyu is the most populous part of the Protectorate and is thick with cultivation. From Fort Hall, which is the centre of the best sisal land, there is a continuous line of villages northwards as far as Nyeri in one direction, and westwards as far as Karuris (Kororis) in another. The villages are often invisible being hidden behind banana groves. The banana disappears at the higher altitudes. Limoru is the best neighbourhood for potatoes, and the soil and humid atmosphere are favourable to wattle and other forest growths.

The Nyeri plains to the north of the Kikuyu plateau consist of a succession of plains from 2 to 5 miles broad, covered with black cotton soil, and clothed with short grass. They are separated by deep valleys containing permanent streams, and usually forested, where the soil is red clay. The rainfall is ample, and the water supply plentiful, the district having the forests of Kenya to the east, and those of the Aberdare range to the west. It is well suited to stock-breeding, and the settlers of the Nyeri plains or West Kenya are mainly cattle and sheep farmers. Except on the north, the slopes below the forests of Kenya provide the best agricultural land in the Protectorate. The prevalence of east coast fevers to the south of Kenya makes that district impossible for cattle-breeding. The eastern slopes of Kenya from Embu northwards to Meru are extensively cultivated. North-east of Meru at the south-western end of the Jombais range is Dominuki's village, and from here round to Laichu on the southern foothills the soil is a rich dark loam. There is a palm forest to the north-east of Zaichu. On the north-west side of Kenya there are extensive rolling downs of grass at altitudes of from 5,000 to 7,500 ft. with ample water.

The Laikipia plateau is now coming into settlement and is well suited to sheep. Its southern part is well watered, but farther to the north, where it gets beyond the influence of the forest-covered Aberdare range, the country becomes flatter and drier and the rainfall insufficient.

Generally speaking the Rift valley is a pastoral country. It is fly-free and suited to European stock. The sheep area

is limited, being mainly round Gilgil and Elmenteita, but with the steady grazing down of the coarser grasses by cattle and the consequent production of a fine turf, the available pasture will increase. This is already the case in the Naivasha district where the grazing is very rich and carries a large herd of stock per acre. In the Nakuru district, which is very fertile and highly colonized, all highland crops will flourish. Njoro, on the western escarpment, is the principal wheat centre of the Protectorate. The soils vary from a black sandy loam and the richer elephant-grass loam to a stiff red earth. All these soils will carry heavy crops of maize, and the red earth is suitable for coffee. The region round Lake Solai, where a black sandy loam prevails, is an excellent flax country.

West of the Rift valley behind the cedar forests of Mau is the district of Lumbwa extending southwards from the Uganda railway to the southern frontier. The Lumbwa country proper is the northern portion of this. It is a great dairy-farming country, and also much flax is cultivated. Sheep, however, are not a success. The Sotik country to the south of Lumbwa is too broken up by hills and forests to be good for agriculture. All citrus fruits do well, and it may in the future develop into an important fruit-growing area. The richest part of the Sotik country is in the neighbourhood of the Chepalungu forest, some 50 miles south of Kericho. Both the Lumbwa and Sotik countries are very well watered. The Uasin Gishu plateau to the north is in rapid process of settlement. Already there is a block of 600 farms, and 1,000 white settlers to the south of the Nzoia river. The climate is excellent, and the water supply abundant. It seems destined to be the principal flax area, and perhaps also the best wheat district. It is also suitable for the cultivation of sisal, and wattle grows quickly. There is much good coffee land on the Nandi border and in the Nzoia valley. South and south-east of Eldoret the country is suited to cattle. Sheep farming has begun, and horses should do well, if lymphangitis can be eradicated.

The chief difficulty is communication. Seventy-five miles of unmetalled road lie between Londiani railway station and the township of Eldoret. Sisal and flax require considerable capital for their initial development, and the cost of transport is practically prohibitive. For the same reason only sufficient wheat is grown for home consumption. When the projected railway from Nakuru is made, the situation will be much easier, and the speedy development of the Uasin Gishu plateau may be expected. The new railway will pass through the Njoro wheat district and the rich area along the Molo river where it issues from the Mau forest. This latter district could produce large quantities of maize. The forests in the neighbourhood of Eldama ravine and along the summit of the Elgeyo escarpment contain what is probably the finest timber in the Protectorate. The semi-arid valley of Ndo (Kerio) between Elgeyo and Kamasia could be made very fertile by irrigation which would not be difficult. The narrow plateau at the summit of Kamasia is clothed with fine turf and there are numerous herds of cattle. That part of the Suk plains which lie beneath the Elgeyo escarpment are fertile and cultivated. The numerous streams and cascades descending from the escarpment have water in them for nine months in the year. Farther north the water supply becomes increasingly deficient. On the Suk mountains there is good grazing and plenty of water.

THE LAKE ZONE

The lake zone, which lies between the highlands and the Victoria Nyanza, is a plateau with an average altitude of from 4,000 to 4,500 ft., and a humid tropical climate. Large areas are covered with black cotton soil often very deep. In the neighbourhood of Kibigori it is 20 ft. in thickness. This soil is capable of bearing very heavy crops. The agricultural development of this region is already considerable. The north Kavirondo country is the most populous part of British East Africa after Kikuyu, and produces large quantities of grain and simsim. When the country bordering the

lake is developed and opened up, enormous yields of millet, maize, and simsim may be looked for. Swamp cultivation is already being tried by the Government for bananas, rice, &c. Rice and cotton can be grown over large areas. Near Kibos and Kibigori there are 10,000 acres suited to sugar. On the Vinyo escarpment, which bounds the Kisii highlands to the south-west, there is a broad shelf covered with rich red earth where there is considerable native cultivation. The Kitutu district, at the foot of the Manga escarpment, on the north-west of the Kisii highlands, is said to be the richest district west of the Rift valley. The lake region has been almost denuded of trees by native cultivators, and large tracts are covered in consequence with unfertile muram. As a result of the extensive deforestation only the larger streams survive desiccation in the dry season, and there is no steady supply of water. Some tree-planting has already been done near Kisii. If the upper slopes of the hills could be systematically planted with tropical species, the water supply would certainly improve, and cotton could probably be cultivated with success on the plains bordering the Nyanza.

JUBALAND AND NORTH FRONTIER PROVINCES

The northern half of the Protectorate, as already stated, is, compared with the southern half, of little economic value. It is mainly nyika or semi-arid country. To this general statement there are, however, certain marked exceptions.

In south-western Jubaland there is no doubt that if the water-supply could be improved, either by sinking wells or building reservoirs, many crops could be grown with ease, for there are large tracts in the districts of Guranlagga, Joreh, Kurde, Arroga, Gulola, and Lorian where the soil is very rich. Though there is no actually permanent water, there is a considerable amount that is semi-permanent and hardly ever fails except in the driest seasons.

There is a certain amount of cultivation on the coast, near the Bajun islands, the soil being cultivated by the Bajun people. Other parts of Jubaland where there is grain cultiva-

tion, are the Gosha country, the Gabawein country (between Lugh and Dolo), and certain parts of the Marehan country.

The riverain lands of the Juba are exceedingly rich. The whole country bordering the river from the foothills 30 or 40 miles below Serenli down to the mouth is an alluvial deposit, varying in width from 8 to 19 miles in the lower reaches to a comparatively small area in the higher reaches. In fertility it is stated to be equal to the best lands in Egypt. Maize and simsim do well, and cotton is grown in the district between Yonti and Helwalud. Most European vegetables and fruits can be cultivated. There are 50,000 acres of sugar-land on the banks of the river. The soil is extraordinarily fertile, and the physical formation of the country and the nature of the river lend themselves admirably to irrigation. There might well be a very prosperous future in store for this part of the country.

Outside this strip of riverain land Jubaland may be divided into two parts by a line running between Wajheir and Jebir on the Juba. To the north of this line is camel country; to the south is cattle country. The Somalis own enormous herds of cattle. Round Afmadu the country is flooded by the heavy rains of October and November, and is able to support vast herds of cattle even during two dry seasons. Fly, however, prevails over all this district.

There are very rich alluvial lands round the Lorian swamp, but the rainfall is small, and tsetse fly abounds. Along the Guaso Nyiro, between Chanler's falls and the Lorian swamp, a distance of 100 miles, large areas could be brought under cultivation by irrigation works at comparatively small outlay. The stream flows quietly at about 2 miles an hour. There are no rapids below Chanler's falls, and the banks vary in height from 4 to 12 ft. No river could be better adapted for irrigation purposes, and the water even in the dry season contains much earth in suspension; in flood it would be greatly augmented.

There is no land under cultivation in the North Frontier Province. In the Marsabit area the lava forms a fertile soil,

but the hosts of elephant, buffalo, and other game would make it impossible to grow crops. In Marsabit forest the soil is very thin, and though the trees are fine and lofty, scarcely a night passes without some of them falling. Though spirillum fever is endemic, the climate of Marsabit is on the whole suitable for Europeans and most natives. Cattle and mules thrive, but camels die in the fog, which covers the forest in the dry season up to 11 o'clock. Before the Government station was placed there, the water in the crater lake became intensely foul owing to the corpses of Rendile stock. The sheep and camels came in thirsty from the desert, and the weaker were pushed in and drowned. The Somalis feel the cold at Marsabit and hate going there.

Camels are found in large numbers in Northern Jubaland and the North Frontier Province. The Rendile own great herds, in spite of the poor grazing in their country.

MINERAL RESOURCES

The strength of British East Africa lies in the vegetable rather than the mineral kingdom. There is very little prospect of finding valuable minerals. The whole centre of the Protectorate is covered by a huge lava cap which hides and probably renders inaccessible whatever mineral wealth there may be underneath. Gold is being worked just across the frontier in the Kilimafeza district of Tanganyika Territory, about 15 miles south-west of Longido, on the Orangi river; but in British East Africa it is nowhere found in workable quantities. It is undoubtedly present on the eastern shores of Lake Victoria, and a reef is said to run through Kamagambo, the district lying below the Vinyo escarpment of the Kisii highlands. Iron is found in great abundance. The richest ores are in the Samia district round Berkeley Bay (see 'Geology'). In Kikuyu the natives smelt it and make spears and knives from the iron. Valuable deposits of mica exist in the Machakos hills and are reported to exist on the Jombeni mountains. Limestone is very generally distributed. There are large deposits in the Bura hills and in the neighbourhood of

Kibwezi. In the Kitui district not far from the pool of Kibui there is a small hill composed entirely of limestone. Lime is also worked to the north of Mount Homa and in Rusinga Island. Good building stone is common, the coral in the coast area, and several kinds of volcanic rock forming excellent material for this purpose. Valuable clays are found in the Rift valley, such as those at the south end of Lake Naivasha and near Elmenteita, which are used in the manufacture of paper, and also a light coloured brick. Fuller's earth has been discovered in the Kedong valley, but the amount is not sufficient, and the position too inaccessible for marketable purposes. Undoubtedly the most important mineral deposit in the Protectorate is the soda of Lake Magadi (see 'Geology'). It is of excellent quality, 80 per cent. being in almost equal parts of the carbonate and bicarbonate, and the supply is inexhaustible. It promises to be the largest industry in the country. No important deposits of coal have been discovered in British East Africa. Between Samburu and Mackinnon road stations on the Uganda line, 53 miles from Kilindini, there is a mass of shaly coal filling a pocket about 2 ft. in diameter in a compact grey grit, interstratified with brown and grey shales, and forming part of the Taru grits (see 'Geology'). Samples of the coal examined at the Imperial Institute were found to be of inferior quality, containing as much as 51.25 per cent. of ash. Carbonaceous material has been discovered near Mwele hill. It is black or brown on the weathered surface, but where fractured is a lustrous black. It does not soil the fingers. The structure is coarsely vesicular. It burns without emitting a flame, and requires a fairly high temperature for ignition. The deposit is probably of pleistocene age.

CHAPTER XI

INDUSTRIES

Agriculture — Principal Economic Crops — Forest Products — Stock-breeding — Principal Live-stock — Animal Products — Fisheries — Mineral Resources.

AGRICULTURE

THE variety of soil, altitude, and climate in British East Africa makes it suitable to many different crops of the tropical and temperate type, and it seems likely to develop into a valuable source of raw materials and food stuffs. The indigenous plants of economic value are unimportant compared with the prospects offered to farming and planting, which range from rice and wheat to mangoes and coconuts. As regards essential foods the country is self-supporting, and has in normal years an exportable surplus of cereals.

About one-ninetieth of the total area of the Protectorate, i.e. 1,750,000 acres, is at present under cultivation : the remainder consisting of forest (about 2,000,000 acres) and bush, pasture, and steppe. A very large proportion of this arable land is in the hands of the natives, especially in the lake zone, the Kikuyu country, and Seyidie Province. The shambas of the Kikuyu occupy the whole of the well-watered country between Kenya and the Aberdares, at an average altitude of 8,000 ft. In Nyanza Province, where the hot lakelands are unsuited to white settlement, the surface is closely cultivated by the Kavirondo. These two predominantly agricultural peoples are the chief native growers for export.

Maize, millet (both wimbi and mtama), simsim, beans, and sweet potatoes, are the principal native crops and staple foods. The banana, coconut, and tamarind are locally important. Improved varieties of maize (Hickory King) and of beans

(Rose Coco and Canadian Wonder) have been introduced, and are now largely sown by the natives.

In Nyanza Province the staple food is millet. The chief economic crop is simsim, which has been vigorously encouraged among the Kavirondo, and the production greatly increased. Cotton and sugar canes have also been introduced. In the districts of Mumias and Kisumu, the swamp-cultivation of bananas, rice, sugar, maize, and beans has done well, and when thoroughly established will provide useful food-reserves for years of drought. Cotton has so far been rather disappointing. Coffee may do well.

Among the Kikuyu, cereals, pulses, and sweet potatoes are chiefly grown, and they have lately taken to European potatoes and vegetables. The more advanced are taking up coffee.

In the Taita and Voi districts the rich alluvial earth of the valleys and foothills is under close native cultivation and yields heavily when the rains are good. A simple form of irrigation is practised. Maize is the staple, millet and beans are also grown; bananas and sugar-cane flourish in the valleys, manioc and sweet potatoes on the hills.

In the coastal zone the production of annual crops is very variable, owing to periodic failure of the rains. The coconut and, to a less extent, the mango and tamarind are staple resources. The native obtains from the coconut palm food, roofing material, fibre for ropes, and an intoxicating drink; and when his needs are satisfied, there is an exportable surplus of fresh nuts and dried copra. Maize is produced on a large scale in Tanaland, where good alluvial earth borders the lower course of the river. In Jubaland, where the arable is mainly confined to the river banks, much depends on the Juba flood. When this is high, standing crops may be destroyed; but the following harvest will be exceptionally good.

Generally speaking, native agriculture is of a primitive type. No ploughs or machines are used. The principal instrument is the jemb, a form of spade; but ordinary European hand-implements are now increasingly employed. Before the war these were mostly of German manufacture. In native planta-

tions there is seldom any attempt to keep the ground clean. In the case of coconut plantations, this slovenly cultivation has resulted in so much waste, and in so great an increase both in insect pests and risks of fire, that it has been necessary to deal with it by legislation. Agricultural schools for native instruction have been started by Government and by various missions ; and itinerant inspectors, both native and European, give advice to growers, especially in the Lake and coastal zones. The system of education, however, is much less developed than in Uganda, and native agriculture in the Protectorate has nothing to show which is comparable to the Uganda cotton industry.

To white settlers, the rich agricultural opportunities offered by the Protectorate mainly resolve themselves into farming in the highlands, and planting in the midland and coastal zones. A large range of annual and permanent exotic crops have been tried, many of which are still in the experimental stage. Three at least may now be regarded as established successes, and almost certain sources of future wealth. These are flax, sisal, and coffee : all growing in the highlands. Coffee, introduced in 1901, was the first plantation-crop to achieve success, and is still the least exacting and most hopeful for amateurs and individual settlers. Its principal centres are the Nairobi and Fort Hall districts, where its popularity has caused a rapid rise in the price of rich arable. Small areas are also being cultivated with profit in Nyanza Province and many parts of the highlands between 5,500 and 7,000 ft. : in 1916-17, about 22,000 acres were under this crop. Sisal, which has now become the principal export, demands for complete success a peculiar quality of soil known as ' sisal-land '. This is found most plentifully in the Thika district, which is the centre of this industry. Sisal-growing, which demands a large capital and is more suited to companies than to private enterprise, occupied 20,000 acres in 1917. Flax, a more recent introduction, has so far achieved great success. It is a farmer's crop, but needs skilled cultivation and does best in open country at a high altitude. The Uasin Gishu plateau and Lumbwa region are

probably destined to be the main flax-areas. Other rotation crops which repay the highland farmer are maize, peas, and beans—immense quantities of which are needed to feed native labour—and potatoes. Wheat has been the subject of long and careful experiment. The attempt to obtain a rustless hybrid on Mendelian lines, though it has yielded promising results, has not yet been an assured success, and the crop remains an uncertain one. The country is now, however, self-supporting in wheat ; but since the rich arable of the highlands will give a far higher profit under other crops, the problem of building up an export wheat trade is hardly likely to become practical. Two permanent crops which are still under trial, but may ultimately be of great importance, are black wattle, giving a valued tanning bark, and citrus fruits—i. e. lemons and limes. The swift growth of black wattle and its easy cultivation are very promising, but economic conditions have so far prevented it from yielding a profit. Citrous fruits have not passed the experimental stage, but seem likely to develop into a considerable industry, especially in parts of the midland and lower highland zones, where they do best.

In the coast zone the principal industry at present open to the white settler is coconut planting, which is profitable to those who can afford to sink the necessary capital and wait some years for a return. The potential resources of the land lying on and near the Tana and Juba river-banks as cotton- and sugar-producing areas, were these rivers harnessed and a general system of irrigation assured, does not yet belong to practical economics : and in any event, only syndicates with large capital at their disposal could hope to develop them with success. Should such an enterprise ever be undertaken, and the alluvial silt brought down by the rivers spread over the adjacent nyika, a large area of the richest arable land would be added to the Protectorate. Apart from this, however, a considerable amount of virgin land in the fertile part of the coast-belt awaits cultivation, and will be at the disposal of European planters when the native land titles are finally settled. This will grow coconuts, pine-apples, and

other tropical fruits, and in some parts rice and sugar. Sisal also grows easily on the coral rag of the coast, but its fibre production is inferior to that of the highland crop.

A settler in East Africa needs considerable capital if he is to pursue farming or planting—more especially planting—with success. The use of agricultural machinery is general, and essential if the land is to be worked at a profit. Coffee, sisal, flax, and citrons all require a considerable amount of plant to deal with the raw product. With permanent crops there is generally a waiting-period of some years before the first profits accrue. Raw colonists should not be deceived by the cheapness of undeveloped land, and high fertility of the best areas, into supposing that they can make a fortune from ‘ anything green that grows out of the mould ’. Whilst certain crops (e. g. coffee) are now established on a sound basis, the conditions affecting others are still uncertain. A very slight difference in altitude, soil, or climate, or a combination of all three factors, may mean the difference between success and ruin. These conditions are, however, being steadily worked out, and as regards the older crops may be regarded as settled. The recent formation (1916) of Associations of Coffee-planters, Sisal-growers, and Maize-growers will be a great help to settlers, who should always endeavour to obtain training in the country in the crops in which they intend to specialize.

Mixed farming, however, is undoubtedly the best undertaking for the average colonist. The area suited to it is the most healthy in the Protectorate ; and concessions of mixed land, some of which is uncultivable, and the rest pasture and arable of various degrees of excellence, give far better value than picked plots in developed districts, for which a high price is now asked. On such a mixed farm the bush- and wood-land, when cleared, will generally be found very fertile ; the best will probably grow coffee. Whilst this is maturing, an income can already be made from cereal and other quick-growing crops, of which two harvests annually can be counted on in many districts. Moreover, should the first plantation fail, there is scope for a fresh start in a new direction.

The steps taken by the Government to assist agriculture and planting include the upkeep of a Department of Agriculture, having a special division devoted to economic plants, a staff of agricultural instructors, a mycologist, an entomologist, and inspectors of coffee-plants and of plant-imports. The department runs four experimental farms, at Kabete, Kibos, Mazeras, and Naivasha; and a fifth, on the Uasin Gishu plateau, is projected.

At the Kabete farm, Nairobi district, experiments are carried out in all general crops, including coffee. The farm comprises about 1,250 acres. The tilled area is about 270 acres. There is a successful citrus orchard, from which budded and grafted stock are distributed; but the amount available does not meet the demand. Arrowroot and broom-corn are new crops which have been successfully introduced on this farm. Agricultural students are received for training.

At Kibos farm, North Kavirondo, special attention is given to upland rice, maize, cotton, chillies, coffee, and other crops suited to the lake zone. Large numbers of plants and seeds are sold or distributed to native cultivators. Kapok and tobacco are under trial, but not encouraging. Kibos is a centre of agricultural instruction. Native youths, mostly the sons of chiefs and headmen, are trained, and both native and European inspectors sent out on itinerant tours, especially in connexion with the rice and cotton industries, and swamp cultivation.

At Mazeras farm, near Mombasa, coconuts and tropical fruits are the principal interests. Arrowroot and other crops suited to the coast-belt are grown, and a wide variety of plants is sold and distributed. Mazeras is the centre from which instruction in coconut planting, and in the destruction of the pestilent coconut beetle, is given throughout the coast-belt.

Naivasha farm is almost wholly devoted to live-stock (q. v.); but 180 acres of land on the lake side have been brought into cultivation.

PRINCIPAL ECONOMIC CROPS

Beans

Beans are among the most important native crops, and are also now grown to a considerable extent by Europeans. They are a good crop for settlers to start with, in districts where labour is cheap and plentiful, as they are easy, quick, saleable, and have a heavy yield: but the amount of hand labour needed for harvesting limits their development, and they are so far chiefly grown by Europeans as a catch crop. During the war, the production of beans greatly increased. The bulk of the crop was needed to feed native troops and carriers; but an export trade has begun, and may become important. The most profitable and widely-grown varieties, among both settlers and natives, are Canadian Wonder, which averages half a ton per acre and has yielded up to 1,620 lb., and Rose Coco, yielding up to 1,400 lb. per acre. Noyau au Blanc, flageolets, and broad beans are also heavy croppers in good years. Madagascar and Soya beans have recently received attention and do well. Two crops of beans annually can be harvested, sowing in May and November; but they appear to do best as a rotation crop with maize, flax, and potatoes. An export trade in selected beans for seed has lately developed, and may become important, as it is found that seed grown in East Africa has more vitality and produces far heavier crops than seed raised in Europe. Recently East African beans have fetched as much as £25 to £30 a ton, and much money has been made by growers. The normal price is about £14.

Citrus Fruits

By citrous fruit is meant oranges, lemons, and limes, the conditions for which are very favourable in many parts of the lower highland zone. On suitable soils the trees grow at least as well as in the West Indies, and give heavy yields. The percentage of essential oil and acid appears to be good.

Lemons seem likely to do better than limes, which need skilled cultivation, or oranges, which have so far been poor

in flavour and difficult to market. Sandy loam, with about a 45-inch rainfall, suits them best. Wet, ill-drained land is hopeless. As the fruit is grown for its oils and acids, and the products are to be exported in a highly-concentrated form, vicinity to the railway is not essential; but a regular supply of firewood must be at hand, as the machinery for dealing with the crop of even a small orchard burns a ton a day while working.

Citrus land is at present worth from £2 to £10 an acre, according to position; and a planter should be provided with considerable working capital, about £500 worth of machinery being required. Fifty acres is the smallest orchard which will pay for the installation of machinery; smaller holdings should combine to share an extracting factory. About eighty trees should be planted to the acre, about 20 ft. apart, with 25 ft. between the rows. The cost of trees will be £20 an acre for imported stock coming into bearing in two years; and about £5 6s. 8d. an acre for nursery stock coming into full bearing in four years. Catch crops of maize, beans, or barley can be grown during the first two years. In the third year a light crop of fruit is gathered; and in the fourth anything up to 750 lemons per tree. The maximum is reached in the sixth year. The fruit usually ripens between May and August, but picking goes on all the year. The essential oil is expressed from the rind, and the juice extracted and marketed in the forms of citric acid or citrate of lime. Each acre in full yield should give 16,000 to 18,000 lb. of fruit. The lemon juice will be 30 to 35 per cent. of the total crop, say 6,000 lb. per acre. This can be concentrated to 60 gallons, which should yield about 100 oz. of citric acid to the gallon. At the average London price of £22 per 108 gallons, this works out at £20 gross return per acre. Citrate of lime on the same scale would yield 586 lb. per acre, which, at £27 per 6 cwt., means a gross return per acre of £23 10s. 0d. The wages bill is low, as a 50-acre orchard can be run with 10 or 12 natives. The profits, therefore, appear likely to be good compared with many other branches of agriculture, though less than those which may be expected from coffee-planting, sisal, or flax.

The citron industry is still in its infancy in the Protectorate, the first extracting plant having started work in 1917. The industry promises very well, but owing to the war the first shipment of products only reached England in the autumn of 1918, and the trade analysis is not yet available. The planting of citron orchards is steadily increasing, and the demand for young trees from the Government nurseries exceeds the supply. Of citrous trees, 4,938 were sold in 1915-16, and of rough lemon stock 9,700. The chief districts in which citron orchards are established or projected are Machakos, with 50 or 60 acres of lemons in bearing, and some small navel orange orchards—Chania Bridge, Nakuru, Lower Molo, and Uasin Gishu. Many nurseries of rough lemons have been established, and a considerable acreage will probably be planted in the near future. Unfortunately, a number of insect pests prey upon citrous trees, the most serious being the red scale (*Chrysomphalus aurantii*) which is best dealt with by fumigation. The trees are also subject to fungoid disease, such as 'wither-tip' and 'nail-head rust'.

Coconuts

The coconut palm is the staple resource of the tropical coast zone between Vanga and Lamu; where it grows magnificently on the pockets of deep sandy loam overlying coral rag, which extend about 25 miles inland. It is chiefly valuable for the copra, or sun-dried kernel, from which coconut oil is extracted, and for the tembo or palm-wine obtained from tapping the flower stalk. The fresh nut is a staple food, for which there is a ready sale. The fibre, or coir, is so far little exploited, though a certain amount of coir-rope is made by the natives. The majority of the palms are owned by Arabs and natives, holding shambas or small plantations of about 3 acres each, and by Indians, holding usually about 10 acres each. Some rich Indian merchants with large holdings are gradually buying up the trees of Arabs and natives in their vicinity. This is to the benefit of the industry, as native plantations are often dirty, neglected, and ill cultivated; and contain diseased

and dead trees and general refuse affording shelter to the rhinoceros beetle (*Oryctes monoceros*), which is the curse of the coconut planter. Also, the small native holder more often grows his trees for tembo than for fruit, sometimes tapping them as much as two or three times a day. This ruins the tree, which bears few, if any, nuts : but it pays the native to sacrifice the prospect of fruit in order to get the palm-wine, for which there is a large ready-money native demand. The fresh juice, called tembo-tembu, or sweet, is not intoxicating. It is used by prosperous natives to flavour food. If exposed to sun and air, or collected in an old kibuyu, it ferments, and becomes the intoxicating drink called tembo-kali. The trade in this; and resulting drunkenness, are unmixed evils in the coast zone. Natives will half starve in order to get it. In some places, trees are let to tembo tappers at a rent of 1 to 3 rupees a month, and are then tapped to death. Planters should be careful to avoid buying seed-nuts from tapped palms, which are often offered by natives. Such seed has low vitality, and produces inferior palms, giving little or no fruit. The tembo industry is vigorously discouraged by the Government. Since 1917, trees may only be tapped under a licence costing Rs. 15 per annum, and a tax of R. 1 must be paid for each palm tapped. According to recent reports this policy is succeeding, and tapping for tembo has already declined by 50 per cent.

As a European crop, coconuts pay well. For careful cultivators, who can afford to wait some years for a return on their capital, there is said to be no more certain investment. About a million acres of sandy loam on the coast are suitable for planting. In May 1914, the number of plantations in existence was given as 3,749, with 456,600 trees ; and their number is steadily increasing. Many planters are now replacing rubber by coconuts. Copra is rising in value, owing to the increased demand for coco-butter, and coconut oil for soap. Unfortunately, the native preparation of copra is so slovenly that little of the produce can be sold for foodstuffs, as it is imperfectly dried, and mixed with sand. A capital of at least £20 an acre is needed for the establishment of a plantation : i. e.

£4,000 for 200 acres, which is the minimum that will pay for European supervision. In addition to the purchase of land and erection of dwellings, the total cost of clearing thick bush, planting with selected seed, and cultivation till the trees come into bearing, is estimated at £13 an acre. One hundred nuts should be allowed to the acre, from which 70 to 75 trees will be raised. Palms take 6 or 7 years to mature, but catch-crops can be grown with profit between the young trees. Ground-nuts, simsim, maize, beans, and chillies are the best for this purpose. In the sixth year each palm should give 10 nuts, increasing to the tenth year; from which time onwards the maximum of 50 nuts a year may be counted on. Weeding and manuring greatly improve the crop. Unsuitable soil or bad cultivation may mean barrenness. An acre at full yield should give 12 cwt. of dried copra annually, worth at Mombasa (1917) £25 a ton; 4 cwt. of shell worth £3 a ton, and 4 cwt. of fibre which, if spun into yarn, is worth £30 a ton. The dried leaves, or makuti, are also marketable; 90 per cent. of the native huts are roofed with them, 25 or 30 pieces go to the rupee. Neglecting the fibre and minor products, the gross returns are thus £15 12s. 0d. per acre per annum: a handsome profit on the £20 per acre originally invested, even when the period of waiting is taken into account and the returns from catch crops eliminated. Settlers unable to buy land can rent coconut plantations at about R. 1 per tree per annum.

The great curse of the coconut industry is the rhinoceros beetle, which is highly destructive both of young and mature palms, in the districts where its ravages are unchecked. It breeds in the dead and decaying wood and refuse which usually litters native plantations, and has spread from them to European holdings. A system of trapping has been introduced by the Government inspectors with good effect, and has been willingly adopted by the natives. In 300 traps inspected in 1916, 54,000 beetles, exclusive of eggs, were caught. In 1915 a Coconut Preservation Ordinance was passed, with a view to dealing with this menace, and with the risk of fire from insufficient clearing, but owing to war conditions, was not yet

in force in 1918. Under it, owners of dead, dying, and diseased trees will be compelled to uproot and destroy them, compensation up to Rs. 5 per tree being paid to needy planters. Rubbish heaps, and other likely breeding-places for beetles must be destroyed, and brushwood, weeds, &c., kept down. All plantations must be registered and open to inspection. Registration gives the right to sell nuts and copra, but not tembo.

Copra exports fell heavily during the war. In 1913-14 they amounted to 31,725 cwt., worth £35,587 ; and in 1915-16 to only 9,774 cwt., worth £8,433.

Coffee

Coffee-planting was begun in 1901, and has so far proved, with the exception of sisal, the most successful export crop. The variety grown is *Coffea arabica*, which thrives at a high altitude in tropical countries. It grows best between 5,000 and 6,600 ft., and has even been tried successfully at 7,000 ft. At the higher altitudes the plants mature slowly ; but they may be expected to give both a heavier and more valuable crop when they come into yield, and are also less subject to disease. Coffee requires rich land containing plenty of humus, cleared forest being the best. It must have shelter from prevailing winds, preferably a tree-belt set well back from the plantation, and a rainfall of 35 to 60 in. Given these conditions it is, if not a gold-mine, at least a sound commercial proposition for those who can afford to wait for a return on their capital.

For a coffee-plantation of 200 to 600 acres in a good district, in touch with the railway, about £5,000 capital is required. Choice coffee-land is now worth £10 to £15 an acre in Kyambu and other favourable districts ; and the planter has also to bear the cost of upkeep, less the profit from catch-crops, for three years, until the plants have reached the producing stage. If coffee be taken up as a branch of mixed farming, however, the outlay is much reduced. A general purposes farm at £2 to £3 an acre may include one-fourth to one-tenth of land suited to coffee ; and whilst waiting for his first plants to

mature, the farmer can live on his annual crops, gradually increasing the acreage under coffee. As a matter of fact, a large number of the coffee plantations are small areas of this kind, averaging about 50 acres. The larger plantations are chiefly in Kyambu district, north of Nairobi—which contains quite two-thirds of the whole acreage under coffee—and in Thika district. Here nearly all the plantations are over 100 acres, and are increasing rapidly. In 1915–16 the Government inspector visited 61 plantations, totalling 4,565 acres, in Kyambu, of which 948 acres had reached the productive stage; and 17 plantations, totalling 1,770 acres, in Thika, of which 81 acres had reached the productive stage. In the upland districts of Lumbwa, Sotik, Nakuru, Uasin Gishu, and Nyeri coffee does well, and usually fetches a better price than that grown round Nairobi. Other districts in which attention is paid to this crop are Machakos, Muhoroni, and Kericho. It is now being tried in Nyanza Province. In 1915–16 the total estimated area under coffee was 16,000 acres.

Coffee can be planted in the highlands twice a year, in April and May, and in October and November; the young plants being raised in nurseries. During the first three years catch crops can be grown between the rows, maize being perhaps the best for the purpose. Except at the highest altitudes, a small crop averaging 3 cwt. per acre will be obtained the third year, and more the two following. The maximum yield is given in the fifth and sixth years. This may amount to one ton of cleaned beans per acre; but 800 lb. to half a ton is an average crop. Picking must be done immediately the berry is ripe, as if left on the tree a fungus develops, and spoils it. A large harvest labour, chiefly women and children, is therefore required. The beans are then fermented for 18 to 36 hours, washed, and dried. They are then hulled, or sent to a curing works for this process; or, if no machinery is available, are shipped 'in parchment'.

With average good fortune a coffee planter should recover his whole capital in his first three harvests: the net yield per acre, when markets and freights are normal, being £13 to

£15, and gross yield about £18. During the war the price of East African coffee has fluctuated enormously, but always stands high. In November 1918, Nairobi coffee fetched in the London market £112 to £145 per ton, with Uganda coffee at £90 to £108. The pre-war price was £60 to £90, and an average of £75 may safely be reckoned on.

It was at first hoped that highland coffee might escape the diseases which have wrought such havoc in Ceylon; but unfortunately the coffee-leaf disease (*Hemelia vastatrix*) made its appearance some years ago. Two insect pests (thrips and cut-worm) also do a good deal of damage. Coffee-leaf disease is less virulent in East Africa than in other countries, and can be controlled by appropriate spraying, the trees showing good power of recovery after attack. It is most prevalent in damp and heavily-shaded plantations. An ordinance to control the sale of coffee-plants, with a view to checking its dissemination, came into force in 1915. Cut-worms chiefly menace the young plants. Ceaseless care is needed to ward off all these pests.

The natives are now beginning to take up coffee-planting; though many settlers are strongly opposed to this, as they believe it will lead to thefts from their plantations. The appointment in 1914 of a Government coffee-plant inspector, with power to order the cleansing, spraying, &c., of diseased or neglected plantations, has been of great benefit to the industry.

In Nandi forest an area estimated at 160,000 acres is covered by an undergrowth of wild coffee, yielding about two million pounds of berries annually. The beans are smaller than those of plantation coffee, but of good colour and flavour.

Cotton

The production of cotton has so far been disappointing, and is never likely to rival that of Uganda. Two regions are suited to it: namely, the Kavirondo country bordering Lake Victoria, where vigorous efforts have been made to promote it as a native industry, and the alluvial land on the banks of the

Tana and Juba, which might, under a system of irrigation, become a great cotton area. This, however, could only be done on a profitable scale by a syndicate, commanding large capital and an ample supply of labour. On a small scale, cotton can only be grown profitably by Europeans as a catch crop. This is done in the coconut plantations of the coast, where it realizes under normal circumstances about £4 an acre. As a staple crop, it cannot be made to yield more than 10 or 15 per cent. profit, and this does not satisfy the white planter; especially as the yield is uncertain, depending on favourable rains, and the plant, being subject to many insect pests, requires expert supervision.

In the Kavirondo country, the cottons sown are the long-stapled varieties grown in Uganda. The industry made a good start, and in 1912-13 lint valued at £11,831 was exported. But the drop in price consequent on the war, together with a succession of unfavourable seasons, discouraged the natives; and little or none has been planted during the years 1914-17. Abassi cotton has been tried on the coast, but only succeeds under irrigation. It does well on the banks of the Tana and Juba.

The British East Africa Corporation has three ginneries in the Protectorate : at Malindi, Kilindini, and Kisumu.

Flax

Flax-growing in the highlands, though it has only recently emerged from the experimental stage, may already be regarded as an established industry. The area devoted to it is steadily increasing, and the fibre exported to Europe has been pronounced of excellent quality, ranking with the best Irish flax.

Flax does best at an altitude of 6,000 to 7,500 ft., on any and that is not water-logged. As the plant is mature in $3\frac{1}{2}$ months from sowing, two crops can be harvested yearly. Only the best clean Russian seed should be sown ; Indian flax is unsuitable. About 100 lb. of seed is allowed to the acre. The quality of the fibre depends on an early rainfall, and farmers must be prepared for at least one bad season in three. Skilful

cultivation is needed, if an evenly-grown crop is to result and the maximum profit to be obtained. So far, threshing-out of the linseed has been done by hand, at about Rs. 2 an acre ; an expense which could be much reduced if threshing machines were employed. Dew-retting and water-retting of the straw is practised ; not, as yet, the tank-retting which produces the finest Belgian flax. Belgian and Irish experts are at work in the country, deciding on the best way of treating the crop. The crucial point in the flax industry is the setting up of factories for handling the retted straw in close proximity to the farms, as the bulk of the straw makes its transport in the unprepared state unprofitable. The profits of a farmer or, still more, a group of farmers owning their own factory would be enormously enhanced. Large factories serving about 600 acres pay best. The war checked the building of flax factories ; nevertheless, on the Uasin Gishu, which is probably destined to be the chief flax area, one is completed, two large ones were nearly finished in 1917, and several others were being built. In Lumbwa the factory of the Highland Flax and Fibre Syndicate has been running since 1915. With the return to normal conditions the industry is almost certain to develop rapidly. Nakuru and Londiani are other districts in which it is becoming an important branch of farming.

The great advantage of flax over sisal or coffee lies in its quick return—the retted straw being sent to the factory within a year of sowing—and in the absence of a waiting-period. On a general purpose farm it makes a good rotation crop with wheat. For regular flax culture a suitable area is 1,500 acres, 400 being under flax at any one time. Calculating the land at £3 an acre (£4,500), buildings, tools, &c., at £4,000, and one year's working expenses at £2,500, total £11,000, a profit of 50 per cent. on capital may be looked for from the second year onwards.

On a well-cultivated farm a crop should yield at least $1\frac{1}{2}$ ton of retted straw and 420 lb. of cleansed linseed per acre. A first-class crop will be 25 per cent. above this. The cost of seed, cultivation, and retting, until the straw goes to the mill,

averages £4 an acre ; giving, at average prices, a profit of £12 10s. 0d. an acre. Where the farmer has his own mill his profit, with flax at £180 and tow at £75 a ton in London, may be calculated at over £30 an acre per annum ; but it must be remembered that inexpert labour increases the proportion of tow to flax, with a corresponding loss of profit. During the war the above prices have been greatly exceeded, as much as £300 a ton for East African flax having been obtained ; but even when they descend to a normal figure—say £120 for flax and £56 for tow—the crop will still be a profitable one.

Fruits

On the coast-belt a large number of tropical fruits, originally introduced by Arab settlers, are now perfectly naturalized. These include the orange, lemon, and lime (see 'Citrous Fruits'), pine-apple, guava, pomegranate, and custard-apple (*Anona reticulata*). The tamarind (*Tamarindus indicus*) is a favourite food of the Swahili. The mango (*Mangifera indica*), and betel-nut (*Areca catechu*) from India, cashew (*Anacardium occidentale*), and paw-paw (*Carica papaya*) from South America, and jack-fruit (*Artocarpus integrifolia*) all flourish. All these are cultivated ; and improved varieties of several, especially pine-apple and paw-paw, are raised in the Government nurseries for sale.

A wide variety of deciduous fruits have been tried by settlers, often with success, at altitudes of 5,000 to 7,000 ft. ; but most of them are still in the experimental stage. South of Nairobi, Ulu and Machakos seem to be the best fruit districts. In the highlands proper, Njoro and Nakuru have been found suitable. Amongst proved successes are Japanese plums, which bear well and early, especially the varieties called October Purple, Satsuma, and Sultan ; sub-tropical peaches, especially Angel and Peen-to ; strawberries, loganberries, loquats, and quinces. Apples are doubtful ; they sometimes do well at the higher altitudes, but are not likely to be a success until the South African varieties, which do not need frost, are introduced. Pears and cherries are usually a failure.

and grapes on the whole have been disappointing. Apricots and figs are promising, but suffer in dry years, especially the last, which often drops its fruits before ripening. Fruit-growing as yet is a small industry, and the produce is consumed locally. Experiments with a view to determining suitable varieties for export have been going forward for some time at the Government Farm at Kabete.

Maize

This is probably destined to be one of the great crops of the future. It grows splendidly both in the highlands and on the coast, and compares favourably with the South African crop. The area under maize was greatly extended during the war, when immense quantities were required for feeding native troops and porters. It is much grown by natives in Nyanza Province, and has now become a main crop with many farmers, especially in the Molo valley, which is the chief district for this crop. Maize gives a quick and safe, if small return. Little capital is needed for it, and the local demand is enormous, as it is a staple native food. There are large areas still unploughed in Nakuru and Uasin Gishu districts which are well suited to it, but it will grow almost anywhere on well drained land. New coffee land is greatly improved by a first crop of maize, which takes very little nutriment out of the soil. There has been in the last few years a steady grading up of the quality produced in the east and north. Yellow maize is being discouraged, and white Hickory King, the most suitable variety for export, substituted for it. The average crop is 6 to 11 bags (of 200 lb. each) to the acre, but under scientific cultivation 16 could be obtained. In 1917, 470,000 acres were under maize, with an estimated yield of 2,820,000 bags. Most of this was required for local consumption; but the surplus for export was expected to be 130,000 bags in that year, 260,000 in January 1919, and 500,000 in January 1920. The famine which broke out in the autumn of 1918 upset these calculations, and compelled the importation at a high price of maize from South Africa,

As maize is a good silage crop, it would seem advisable to arrange for the conservation of stocks to tide over bad harvests, before proceeding to the development of an export trade. The production of industrial alcohol from maize has been suggested, and may be an important industry in the future.

Maize must be planted between March and May, in well ploughed land, and requires thorough cultivation. One small cultivator may be reckoned to every 40 acres. It is remarkably free from disease, though sometimes damaged by cut-worm. The usual method of harvesting is hand-picking when the ears are thoroughly dry. At the present price of native labour, harvesting machinery does not pay. In many parts of the highlands two crops can be grown annually. Where this is the case, an early variety should be sown for the short hot season following the 'little rains', and a main cropper, such as Hickory King, for the long mild season succeeding the 'big rains'.

Weevils cause much destruction to the native maize crop, largely because it is stored in dark and airless huts. A more open and ventilated type is now being recommended by the authorities.

As a money crop maize pays the farmer at a price of 10s. 6d. per bag of 200 lb. on rail, or 11s. 8d. delivered at Kilindini.

Millet

Both mtama or tall millet (*Sorghum vulgare*) and wimbi (*Eleusine corocana*) are grown by the natives for food. Large quantities of wimbi are raised in the Lumbwa and Sotik districts. In the Victoria lake-zone and among the Kikuyu millet is the staple food, and both kinds are extensively grown. In good years the Kavirondo produce an exportable surplus. It is of easiest culture, and on hot dry land the yield often exceeds 50 bushels per acre. The stalks of mtama are chewed for the sake of their sweetish sap, and are known as kota

Potatoes

Potatoes are now among the principal food crops grown by settlers, and are becoming very popular with the natives. They grow vigorously in the highlands, especially round Limoru; and on virgin land (cleared forest) a yield of 9 tons an acre can be obtained. Continuous cropping soon reduces this. On general-purpose land, without manuring, 4 tons can be counted on in normal seasons, with a maximum of 6 tons. This pays the grower well, as two crops can be grown annually. The yield of potatoes is extremely variable, being affected by weather, seed, &c., and often much reduced by the depredations of porcupines. From experiments conducted at the Government Farm, Kabete, the most generally useful varieties appear to be Langworthy, Epicure, and British Queen. Re-sowing with locally grown seed quickly reduces the yield, and so far it has been found necessary to import fresh seed from Europe at frequent intervals. Should potato growing develop on a large scale among the natives, Government control of the seed will probably be essential. Efforts to establish an export trade in potatoes have not yet been successful, owing to difficulties of packing and transport. Consignments sent to India, Egypt, and South Africa arrived in bad condition. With better facilities, and greater experience in the best varieties for export, there seems no reason why a good foreign trade should not be built up.

Sweet potatoes (*Ipomaea batatas*) are much grown by the natives for food, especially between the coast and Lake Victoria. They are a favourite food of the Kikuyu, and are much used as fodder for pigs. As a possible source of starch, potato-flour and alcohol, they may in future have economic importance.

Rubber

It was originally expected that rubber would prove a staple product of the Protectorate. Large plantations were established on the coast belt, and thousands of Ceara trees planted mainly at Malindi, Mombasa, Mazeras, Witu, and the mouth

of the Tana. In 1910 and 1911 the prices obtained for export were satisfactory. The development of the industry, however, was very disappointing. Rubber requires a constant rainfall, and cannot withstand the dry seasons which occur in East Africa ; and even where the yield of latex was fair, the price offered for Ceara from 1912 onwards was too low to repay the planter. Since 1915 the rubber industry has been dormant, and many owners are taking out their trees and replacing with sisal and coconut, which promise a far better return. The exports declined from 1,279 cwt. in 1914-15 to 500 cwt. in 1915-16.

Simsim

The growing of simsim or sesame is much encouraged among the natives. It is now the chief economic crop of Nyanza Province, where it is largely eaten. There is a sound local market, and an export trade in the seed and oil. Simsim does best in Kavirondo ; and Kisumu is now the centre of a vigorous local industry, which has been built up in a few years by intelligent supervision. In some parts the output increased fourfold between 1912 and 1916. Improved seed has been imported by the Government and distributed, and has yielded on trial plots 280 lb. per acre. Owing to its high monetary value per ton, simsim pays native growers better than maize or beans, in districts where high freights have to be considered. It is a good storage crop, and a valuable stand-by against years of famine. European planters can only grow it profitably as a catch-crop ; and it is much used for this purpose in coconut plantations on the coast.

The exportable surplus, after supplying the large native demand, is a good deal less than it was some years ago. In 1912-13 it amounted to 80,461 cwt., value £59,123 ; and in 1915-16 to 44,867 cwt., value £25,343.

Sisal

Sisal has become during the last few years the most important economic crop of the Protectorate. It is a hard, strong,

whitish fibre, extracted from the leaf of *Agave sisalana*, and used for cordage. The plant, which is a native of Mexico, was imported into German East Africa in 1893, and in 1907 into British East Africa. The Germans attempted to prevent the spread of the industry into British territory by an export tax on the bulbils from which young plants are raised, and for a time checked its development. Nevertheless by 1911 over 800 acres were under sisal, in 1913, 7,000, and in 1917 at least 20,000.

If it is to be profitable—that is, to produce the maximum size of leaves and longest fibre—sisal must be grown on the special quality of soil known as ‘sisal land’, in which the constituents of the ‘cotton soil’ and red loam are both present. It needs plenty of lime and humus. Exposed situations seem to suit it best, especially slopes with sharp drainage. It must have full sun and can stand a long drought. At 5,000 ft. it does excellently, and is now being tried at Naivasha between 7,000 and 8,000 ft. The best plantations are in the Thika river district, where there were 5,000 acres—since increased—in 1915. It is also growing successfully in Kikuyu, Machakos, Voi, and on the coast. The land on each side of the Uganda railway, from the north end of the Taru desert to Makindu, will probably be in the future a great sisal belt. Sisal is propagated either by suckers or bulbils i. e. the buds upon the pole or flower stem. It is planted in squares, about 650 to 1,000 plants to the acre. Catch-crops, mainly beans, peas, and maize can be grown for the first 2 years. Though in Yucatan and the West Indies sisal takes 5 to 8 years to mature, in East Africa a first crop of leaves can be taken when it is 3 years old, and it continues to yield for another 2 or 3 years. After this it ‘poles’ i. e. throws up its flower-stalk, bearing about 2,000 bulbils, and dies. The land must then rest for 12 months before replanting.

From 20 to 80 leaves are cut from a plant during each of its producing years. These are 3 ft. to 6 ft. or even more in length, and from 4 to 6 in. wide. On poor soils these leaves are small, though fibrous; on good upland soil, large and

heavy. It takes 11 to 20 leaves of upland sisal to yield 1 lb. of fibre ; whilst 16 to 35 leaves of coast sisal are needed to produce this quantity. The length of the fibre adds appreciably to its value. Leaves 9 to 10 ft. long have been produced in the best plantations of East Africa. A total of 3 to 4 tons of fibre per acre is obtained during the life of the plants on good sisal soils. After cutting, the fibre is extracted from the leaves ; decorticating machines for this being installed in all the principal plantations. Electric power is the best for a sisal factory, and planters should try to secure access to a watercourse capable of developing it. Oil engines are used on some plantations. An ample water supply is essential. After decortication the fibre is washed, air dried, brushed, and put up for export in bales of about 2 cwt. Owing to its bulk, it can only be handled with profit where transport facilities are good.

Sisal is a crop more suited to syndicates and capitalists than to the small or mixed farmer. It must be grown on a large scale to pay for the expense of installing machinery, tramways, &c., the initial outlay needed is large, the labour bill is heavy, and no return but that derived from catch-crops—which many planters regard as a doubtful benefit—can be had for the first three years. For an estate of 3,000 acres, of which 200 are planted yearly, a capital of at least £20,000 is considered essential. In the first year, land (at £2 an acre) will cost £6,000, and installations, planting, wages, &c., £2,800. In the 2nd and 3rd years, planting and wages will cost £1,350 a year. In the 4th year these charges, with the installation of decorticating machinery (£5,500), purchase of oxen, &c., will amount to £8,000. In the 5th and subsequent years, annual expenses will be about £5,000, and receipts from 600 tons of sisal at the conservative figure of £20 a ton on rail will be £12,000, giving a profit of 36 per cent. on the invested capital, without calculating anything obtained from catch-crops, or early cutting of young plants. Some optimistic writers place post-war profits as high as 43 per cent. but such an estimate is purely speculative. At present

(1918) the price in the country is £33 to £40 a ton ; and in London about £90 a ton. A plantation of this size can be served by one decorticator, and will require about 350 labourers. The total production of the Protectorate has risen to 800 to 1,000 tons of fibre a month, which is in excess of the present available tonnage ; and with the return of the planters to their estates after demobilization it should be much increased. Fifty thousand tons annually could be exported, and there is little fear of over production. The demand in England is large, but a heavy drop in price on return to normal conditions appears more certain in the case of sisal than in that of flax. Expenses also will tend to rise. Sisal land is rapidly advancing in price. In the Thika district, the best is already worth £5 to £7 an acre ; and an estate of 1,500 acres within reasonable distance of the rail, including only 50 per cent. of cultivable ground, will now hardly be obtained under £3 an acre. Clearing, ploughing, and planting will probably cost £5 an acre in addition. Nevertheless, the cost of production being lower in East Africa than in any other country in the world, the outlook on the whole is a promising one.

Sugar

Sugar-cane has long been grown on a small scale by natives for *tembo*, which is made from the juice, and by Indians for *jagree* or crude sugar. As a European crop it is still in the experimental stage, but trials with canes from various countries have been very successful, and it seems possible that this may become a flourishing industry in the future. The canes will probably do well up to 5,000 ft., and possibly higher ; but the best sugar districts are undoubtedly the Kibos and Kibigori districts on Lake Victoria, where it can be cultivated without irrigation, and the alluvial lands bordering the Tana, Juba, and Sabaki rivers. On the lower Tana alone there are 241,000 acres of good sugar land. Unfortunately all these regions are very unhealthy for Europeans. The sugar industry would need to be developed

by capitalists on a large scale, the cultivated areas being grouped round large modern factories. Under some system of Imperial preference, a profitable export trade might then be developed. Labour must for long be a difficulty, especially the skilled labour and expert supervision needed in the factories. The good quality of Kavirondo labour is a great advantage to the sugar areas in the lake district.

For export purposes, inland sugar cannot compete with that grown in Portuguese East Africa and South Africa, which is entirely sea borne ; as it will not bear the cost of rail transit to the coast. The future of the sugar trade is therefore bound up with the development of the lower Tana and Juba.

Tobacco

Persistent efforts have been made in the coast and highland zones to cultivate European tobacco, and a tobacco adviser has been appointed by the Department of Agriculture to further this crop ; but so far the results have been inconclusive. A leaf suited to European tastes can be grown on the light sandy loams of the Kibwezi and Machakos districts, but the uncertain rainfall is much against it, and nothing of high quality has been produced. The series of experiments at the Kabete Government Farm have been disappointing. It is believed that a Turkish cigarette tobacco might grow on the coast ; but the red soils which are found in most parts of the Protectorate will not produce a light or mild leaf. A coarse variety is commonly grown by natives for their own use, but is unfit for Europeans ; and on the Kamiti plains South African ' Boer ' tobacco is successfully grown and finds a local market.

Wattle

Black wattle (*Acacia decurrens*), producing a valuable tanning bark, grows well and easily in the highlands. The trees reach maturity and are ready for stripping in their 4th to 5th year, as against the 5th or 6th year in Natal and other countries, and give bark having 4 or 5 per cent. more

tannin. It does best between 6,500 and 7,500 ft., and requires a good rainfall. So far, the best wattle districts appear to be Limuru, Londiani, Njoro, Nakuru, Kikuyu, and Lumbwa. About 10,500 acres were planted in Limuru, Njoro, and Kikuyu between 1911 and 1913, and are now coming into yield.

But little time or labour is needed for wattle. In suitable districts, the bush need only be burnt off and the seed planted. The seedlings when up are well thinned, and the ground kept free of weeds for the first 18 months. At the third year the trees are thinned to 9 ft. apart; the bark from these thinnings should pay the expenses of the plantation to date. The trees are then left till fit for stripping. At 5 years old they should be 6 to 8 in. in diameter and 90 ft. high, and yield 4 to 6 tons of bark to the acre. Planters near the railway can sell all waste wood for fuel. The timber, however, is of considerable value for other purposes.

Owing to the bulky nature of the crop, and high freightage consequent on the war, it has so far been impossible to export wattle at a profit, and the industry has passed through a period of great depression. With the return to normal conditions, however, its recovery is practically assured. The world-demand for wattle is far greater than can be met by South Africa, and already the Tanners' Federation of the United Kingdom has taken steps to get into touch with East African growers. Wattle is dealt with in three states (1) chopped and pressed bark, (2) ground bark, (3) tannin extract. Tanners able to grind their own bark will always buy it in the chopped state, the only one in which it is possible to tell the quality before use. Ground bark will be bought by those having no grinding facilities. The extract, so far nearly always unreliable and poor in quality, is usually made from the inferior bark, which would be unsaleable in the chopped state. As yet, no extracting plant has been set up in East Africa, but this will probably be done in the future. As the quality of the East African bark is superior to that of Natal, and the yield per tree higher, there seems no reason why the industry should not succeed.

Wheat

Wheat has been grown experimentally in the highlands for some years, but cannot yet be regarded as satisfactorily established. The great difficulty lies in finding a permanently rustless variety. So far, each cross introduced is at first highly resistant, and succeeds well for a time; but in spite of claims to the contrary, rust appears sooner or later. The only way in which the industry can go on successfully seems to be by the regular breeding of fresh varieties on Mendelian principles, eliminating the strains which show any tendency to rust. Njoro is the chief centre of wheat growing, and the most successful experiments in breeding and testing on the above lines have been made on the Delamere estate. Since the produce of at least 60,000 acres is required for local consumption within the Protectorate, and the country is as yet barely self-supplying, there is an easy market for all that is grown. Wheat, however, cannot be a profitable crop unless grown on a large scale, and harvested by modern machinery. The first outlay is therefore considerable. It does best at an altitude of about 7,000 ft. with a rainfall exceeding 30 in.; the chief wheat districts at present being Uasin Gishu, West Kenya, and Njoro. The ground should be fairly level or gently rolling, to permit easy use of ploughs and harvesters, and also fairly near the railway. After the first 10 miles, for every 15 miles from the railway 25 per cent. more wagons are needed, thus greatly increasing the gross cost of production. On suitable land, two crops can be raised annually. Sowing takes place in November and May, harvesting in February–March and September–October. If machinery is used the cost of labour is small, and the total cost of production should not exceed £2 an acre. The usual machine is the Australian combined harvester and stripper. Two will harvest 150 to 200 acres. The average good crop is 800 lb. an acre, worth at normal prices £4 10s., but the yield appears to be very uncertain. On large farms wheat works in well with live-stock, which provide an outlet for the by-

products. Oxen are required for ploughing and transport, and horses usually do well in wheat areas. It has recently been found that wheat makes a good rotation crop with flax, and that on land which has just borne flax the tendency to rust is much decreased. This is probably because flax takes a great deal of nitrogen from the soil. On the other hand, average highland arable gives a far higher return under flax than under wheat; and rich land under coffee. It will probably in the end pay the European population to import its wheat, and export flax and coffee in exchange. The apparently unavoidable expense of nurseries for the breeding of rust-free seed is a heavy charge on the wheat industry. The most important of these nurseries is now run by the Department of Agriculture, in conjunction with Lord Delamere and other large growers.

Miscellaneous Crops

Among food-crops grown locally by natives for their own use are bananas and cassava; but neither of these are produced on so large a scale as in Uganda, maize and millet being the staple foods. Bananas are grown principally in the Kavirondo country, and also to some extent in the Kikuyu and Taita districts. Exotic varieties for table use have been imported.

Ground-nuts are cultivated both by settlers and natives in the coast and lake zones, and make a good catch-crop under coconuts. At one time they were much grown in Mumias and Kisumu, where a yield of 1,000 lb. an acre can be looked for, but owing to the outbreak of disease, the crop was almost abandoned by the natives. Ground-nuts do not succeed in the highlands. They are of value to the cultivator on account of their power of storing nitrogen in the soil, and economically worth attention both as an oil-seed and as a storage crop. 234,353 lb. were exported in 1916-17. Were machinery for shelling introduced, ground-nuts would probably be the best of all catch-crops.

Rice has not yet developed to any great extent. In the

Mumias and Kisumu districts, a number of small swamps have been drained and put under this crop with success, but the area devoted to it seems to be decreasing and it is hardly likely to develop without direct Government encouragement. Large areas of suitable land are available, and it may in the future become of great importance. Upland rice has also been grown successfully on a small scale.

Chillies are grown to some extent as a catch-crop, but nearly the whole of the exported crop is raised in Uganda.

Various tropical products have been grown experimentally, both in the Government farms and by settlers. Of these the most important are kapok, the silk-fibre tree (*Eriodendron anfractuosum*), which seems likely to do well on the coast, and arrowroot, which was very promising. In 1914 several thousand plants were distributed to settlers, but the outbreak of war, and the cessation of demand, has temporarily checked the development of this crop. Cocoa and tea, which have been tried for some years, seem unlikely to succeed.

In the highlands, various cereals have been tried. Barley does well, and does not rust, but the demand for it is small. Oats rust badly.

The excellent grazing in the pastoral districts makes fodder-crops unimportant. Lucerne, however, is raised round Naivasha, Limoru, and other cattle centres, as an auxiliary food for dairy stock, working oxen, and pigs. Six tons per acre are obtained without irrigation, and on Naivasha, where seepage takes its place, as much as 12 tons per acre per annum. Several forage grasses have been introduced perhaps the most important being *Paspalum dilatatum*, a rich cattle-food yielding about 8 tons to the acre when cut green. Teff grass (*Eragrostis abyssinica*) is vigorous, and matures in about $2\frac{1}{2}$ months, giving in good seasons $3\frac{1}{2}$ tons of hay to the acre. Burnet, sainfoin, canary grass, sulla, Wolth's grass, and toowoomba all grow well. Tall oat, Rhodes grass, and couch grass, which make together an ideal cattle diet, have been introduced in some districts.

Roots are little grown, but mangolds have been tried on a small scale, and do well at about 6,500 ft. A recent introduction which seems likely to succeed well is broom-corn (*Panicum crus-galli*), from which the ordinary carpet-broom is made. The first switches produced are said to be of high quality.

European vegetables are generally grown for domestic purposes in the highlands. Many kinds do extremely well, especially peas, beans, cauliflowers, and cabbages. An export trade in peas for seed is developing, as it is found that seed grown in East Africa has a higher vitality than that produced in Europe. Stratagem, Telephone, and American Wonder are so far the favourite varieties. Two crops can be grown yearly, and over 700 lb. an acre has been harvested. Peas are difficult to grow on a large scale, owing to the great amount of harvest labour required. The crop must be gathered quickly, as they soon dry and burst, with consequent loss of seed.

European vegetables are now being taken up by the natives, who grow them for their own use and also for market. A flourishing trade is done in them by Indians in the Nairobi district.

FOREST PRODUCTS

Timber

The extent and quality of the indigenous timber forests have already been dealt with under 'Vegetation'. Among the more valuable woods which they contain are camphor, cedar, yellow-wood, ironwood, sandalwood, and ebony. At present, the forests must rank among the partially developed resources of the country, as they have only been exploited to a limited extent. The hasty alienation and destruction which marked the first years of settlement, when the valuable sandalwood near Nairobi was almost exterminated, have given place to a rigorous system of conservation. Trees in the Government forests may only be felled under licence, and all forests are now worked on a basis of improvement-fellings, on a 40 years'

rotation. The Kenya forest, which has been valued at £14,000,000, is still almost untouched.

The highland forests as a whole are estimated to be worth about £10 an acre if properly worked ; but some parts—for instance, the great yellow-wood belt in the Lingham & Grogan concession, and the best of the cedar areas—are far more valuable. Nevertheless the timber has so far been rather disappointing. Many of the largest trees are unsound or ill-shaped and it is difficult to obtain large planks of the more valuable species. The cedar, in which great hopes were placed, is well-grown, mast-like, and of great size in the best areas ; but often brittle and liable to fungoid disease. The huge trunks found in the virgin forests of Mau and Kenya are generally hollow. At present, but little timber except mangrove-poles is exported. The local demand for seasoned wood exceeds the supply, and a considerable though decreasing amount of constructional timber—mainly deal and pitch pine—is imported. As stocks of pillar-wood, yellow-wood, cedar, ironwood, and other local timbers accumulate, this should cease ; as the native woods will meet all ordinary needs, and several are suitable for high-class cabinet work. A small amount of pencil-cedar is exported from the Lingham & Grogan forest. The following saw-mills are now at work, and concessions for others have been granted :

The Equator Saw-mills Ltd. (Lingham & Grogan) with 4 steam-power lumber mills and a modern joinery mill, working the Lingham & Grogan concession in Mau Forest. Head-quarters at Molo, subsidiary mills at Eldalat and Maji Mazuri.

The B. E. A. and Premier Mills, Nairobi.

Limoru Mill, between Limoru and Escarpment.

Clutterbuck's Mill, near Njoro.

Premier Mill, Lumbwa.

• There are also many Indian handsaws.

An important aspect of the timber question in the Protectorate is the supply of fuel for the Uganda Railway. A system of supply by contractors was at first in force, and

resulted in the burning of much valuable wood from private forests, which should have been reserved for other uses. In 1915 a scheme for the gradual substitution of a Forestry Department fuel supply was sanctioned, and 3 cutting-camps were opened. This policy will economize both money and timber. During the first year the camps cut 584,385 cubic ft. of green fuel, of which the railway took 271,445. The remainder of the railway requirements, which amounted to 9,248,567 cubic ft., was supplied by contractors.

A large amount of firewood, obtained chiefly from the scrub-forest and undergrowth, is cut under licence, and sold from the forest reserves. In 1913-14, 5,872 monthly licences were issued for this purpose and 78,141 cubic ft. of fuel sold.

As regards the conservation of the timber resources, regular afforestation is now undertaken, especially in the forests of the railway zone. Muho (*Markhamia hildebrandtii*), which has a rapid growth and makes good fuel, is much planted for this purpose. Owing to the slow rate of growth of the indigenous giant timber trees, the naturalization of quick-growing exotic species is regarded as more hopeful for the future than the sole propagation of native varieties. Among the best species for this purpose are the silky oak (*Grevillia robusta*) which prospers at about 5,000 ft., various species of eucalyptus, including the ironbarks and tallow-wood, some of which in three years grow to 20 or 30 ft. high, and Guatemala and Himalayan cypresses (*Cupressus benthami* and *C. torulosa*), which succeed between 5,000 and 8,500 ft. Teak (*Tectona grandis*) does well on the coast. Among native species, cedar, sandal, pillar-wood, muho, and mairozi are regularly planted. Forest nurseries are established at Mwachi (Mombasa), Karura, Dagoreti, Lari, Njoro, Londiani, Nyeri, West Kenya, Kapsaret, and Kakamega. In 1913-14 these sold to the public 222,518 young trees, 340 lb. of seeds, and issued free 55,078 trees and 215 lb. of seeds.

The principal exportable timbers of the highland zone are cedar, camphor, yellow-wood, ironwood, and greenheart; of the lower highlands, sandal; of the coast zone, ebony and

mangrove. The trade in mangrove-poles (borities) is important. They resist termites and are in great demand for building purposes. In the highlands, there is a large and steady output of poles and bamboos, chiefly required for native huts. The wholesale destruction of saplings for this purpose has now been checked, and poles may not be cut from the more valuable trees. They are mostly obtained from the bastard-cedar, mutundu (*Macaranga sp.*), muho (*Markhamia hildebrandtii*), and mukao (*Dombeya nairobiensis*). Poles of mutundu and mukao pay a royalty of 5 cents each; other poles from 25 cents if under 10 ft. to 80 cents if between 15 and 20 ft. Borities, if taken from an unleased swamp, pay Rs. 1.25 per *korja* (score) for poles under 18 ft. and Rs. 1.50 for those over this length.

The following are the most valuable indigenous timbers: weights given are per cubic foot, and only approximate.

Albizia or mkuruwe (*Albizia fastigiata*). Somewhat resembles ash. Weight, fully air-seasoned, 28 lb. Fairly durable for general use, but not for fencing-posts.

Boer-beech or mugaita (*Rapanea rhododendroides*). Weight, green, 74 lb.; fully air-seasoned, 44 lb.

Camphor or muzaiti (*Ocotea usambarensis*). Weight, fully seasoned, 42 lb. A magnificent furniture and construction wood, replacing teak. Splits easily, works and polishes well, turns a fine rich colour on exposure. Hard, with a fine grain, not unlike satin-wood in appearance. Price at Nairobi, December 1915, Rs. 216 per ton of 50 cubic ft.

Cape chestnut or mlalachi (*Calodendron capense*). A useful wood, but not durable. Graded second class for fencing-posts.

Cedar or mtarakwa (*Juniperus procera*). Weight, 44 lb. green, 36 lb. seasoned. Light, easy to work, very durable, and absolutely termite-proof. Suitable for panelling, ceilings, furniture, shingles. First class for fencing-posts. Selected and graded slats of fully seasoned wood are in good demand for pencils and penholders. Difficult to obtain in big planks, and often brittle and inclined to split. Price at Nairobi, December 1915, Rs. 120 per ton of 50 cubic ft.

Croton or makinduri (*Croton ellipticus*). Hard and heavy. Splits fairly evenly. Good for rough work, outbuildings, &c., but is liable to termites and must be tarred, injected, or otherwise treated to give resistance for outdoor use.

Dye-wood or mtikani (*Strychnos* sp.). Very durable. First class for fencing-posts.

Ebony or mpingu (*Dalbergia melanoxylon*). Small, but of good quality. Stems up to 24 in. in diameter can be obtained. Good for tent mallets, walking-sticks, &c.

Greenheart or muziga (*Warburgia ugandensis*). A shapely hardwood, giving an ornamental and scented timber. Very durable. First class for fencing-posts.

Grey olive or mutamayyu (*Olea chrysophylla*). Very heavy, hard, and dense. Good for railway fuel and sleepers. Weight, 80 lb. green, 70 lb. seasoned.

Ironwood or musharage (*Olea hochstetteri*). An exceedingly beautiful furniture wood, taking a good polish, and with a handsome grain. Makes good sleepers and first-class fencing-posts. Weight, green, 77 lb., and seasoned, 54 lb. Price, December 1915, Rs. 120 per ton of 50 cubic ft.

Mairothi (*Maba abyssinica*). One of the best timber trees of the lower zone. The wood, which is much in request by the carpenters at Nairobi, saws easily and takes a good polish, but is soft and not very durable. Good for scantlings and light furniture.

Mangrove or mkoko (*Rhizophora mucronata* and *Bruguiera gymnorrhiza*) gives a durable and termite-proof timber, in great demand for building-poles and rafters, or borities, and for fuel. The wood of mkoko mkandala (*Ceriops candolleana*) is used for the ribs of dhows. There are enormous supplies in the coastal swamps and backlands. Borities which are now worth 3½d. to 4d. each, form the major part of the timber exports. Seventy per cent. come from Lamu, the rest from Malindi and Kismayu.

Mbembakofe (*Azelia cuanensis*). A hard, fairly heavy, durable timber, good for constructional purposes.

Mkoi (*Piptadenia burchanani*). A hard teak-like wood, first

class for fencing-posts. Weight, fully seasoned, 45 lb. per cubic ft.

Muho (*Markhamia hildebrandtii*). A quick-growing species, giving good timber, very useful for poles and fuel. Rarely large enough for sawing.

Mutendera (*Rawsonia usambarensis*). A durable timber, first class for fencing-posts and other outdoor work. Probably the most resistant of all the highland timbers except sandalwood.

Pillar-wood or musaizi (*Weihea africana*) is a shapely, straight-grained tree useful for interior work when thoroughly seasoned. Weight, fully seasoned, 43 lb. per cubic ft.

Safraan or mutanga (*Eliodendron* sp.). Ranked second class for fencing-posts.

Sandal or muhugu (*Brachylaena hutchinsti*). An excellent all-round timber, termite-proof and very durable. Weight, fully seasoned, 59 lb. per cubic foot, which is the same as Indian sandalwood. Intrinsically the most valuable timber in the Protectorate. In respect of easy working and scent it appears intermediate between true sandal (*Santalum album*) and the third-rate quality exported from West Australia and the Pacific Islands. It is excellent for sleepers, fencing-posts, construction, and cabinet work. The refuse is good fuel.

Smoky-heart or ruazi (*Canthium schimperianum*). Weight when seasoned about 50 lb. per cubic foot.

Stinkwood or mueri (*Pygeum africanum*). A heavy, hard, durable wood of a rich red colour. Weight, green, 66 lb., and seasoned, 44 lb. per cubic foot. Useful for furniture and constructions, but not sufficiently durable for fencing-posts. Price in Nairobi, December 1915, Rs. 108 to Rs. 120 per ton.

Tamarind or mkwaju (*Tamarindus indicus*). This supplies the timber of which the best native walking-sticks are made.

Tana poplar (*Populus denhardtiorum*). This may prove a valuable timber. It matures when cut to a deep rich brown, and works and seasons well. In 1910 a licence to cut a million cubic ft. was granted, and at least as much more was believed to be mature and available.

White ironwood or munderendu (*Todallia* sp.). A hard, durable timber, first class for fencing-posts.

Yellow-wood or musengera (*Podocarpus milanjanus* and *P. gracilior*). A useful constructional timber, rather like superior deal, and free from knots. *P. gracilior*, which is the best, has been compared with Kauri pine. Weight, green, 47 lb., and seasoned, 32 lb. per cubic foot. Light, soft, and easy to work. A yellow-wood floor is superior to pine and nearly as good as teak. Not durable for outside work unless treated, but when creosoted makes good sleepers. Resists teredo. Price in Nairobi, December 1915, Rs. 102 per ton of 50 cubic feet.

In the following tables the figures refer to cubic feet, except in the case of poles :

	1912-13.	1913-14.	1914-15.	1915-16.
Timber cut and sold	229,499	195,224	171,576	146,564
Timber issued free to Govern- ment, settlers, and natives	112,127	54,488	54,071	43,211
Government firewood cut for railway	1,383,302	3,435,372	2,955,423	3,531,076
	£2,766	£2,290	—	—
Total firewood consumed by railway	—	7,331,210	7,155,938	9,248,567
Poles and bamboos sold . .	29,085	52,317	—	—
Issued free	7,690	45,553	—	—
Exports of borities	322,206	511,024	324,195	495,363
Value	£3,459	£6,479	£4,537	£8,264

Gum-copal

Gum-copal is obtained from the mtandarusi (*Trachylobium hornimannianum*) which is indigenous in the forests of the coastal zone, especially in Seyidie Province. This tree is easy of propagation, and if planted up and steadily exploited might become a valuable economic resource. At present, the supply of gum-copal seems to depend on casual native collectors, who pay little attention to it unless driven by the failure of their crops. The export, therefore, tends to be largest after years of drought. The following are recent figures :

	1912-13	1913-14	1914-15.	1915-16.
Cwt.	617	692	225	497
Value	£1,662	£1,711	£527	£1,213

Mangrove Bark

Mangrove bark is exported in considerable quantities for tanning, mainly from the concessions in Tanaland Province. The shipments, which amounted to 8,062 tons valued £8,062 in 1913-14, fell during the war, though prices rose. In 1915-16 3,012 tons were exported, valued £4,621. The best bark is that obtained from *Rhizophora mucronata* and *Bruguiera gymnorhiza*, both of which contain a high percentage of tannin.

Wild Rubber

The rubber-vine or mpira (*Landolphia*) grows freely in the open glades of some of the coastal and highland forests. On the coast it flourishes mainly in the scrub-forest and bush, and is only really abundant in a few restricted areas. Such casual collection as takes place is confined to natives, who do not pay much attention to it except in years of drought, when their crops fail. In the highlands its principal stations are in Kenya and Nandi forests. Probably Nandi is the only highland region in which it can be commercially exploited; though a certain amount has in the past been collected in Kenya. Wild rubber may only be collected in reserved forests under a licence, price Rs. 100, and pays a royalty of 25 cents per lb. The amount exported has greatly declined during the last few years, sinking from 1,062 cwt., value £15,252 in 1912-13 to 253 cwt., value £1,774, in 1915-16.

Fibres

The fibre of *Sansevieria*, which is abundant in the midland and nyika zones, has ceased to repay collection since the rise of the sisal industry. The baobab (*Adansonia digitata*), which grows in the same regions, gives a valuable fibre; but so far does not seem to be exploited.

STOCK-BREEDING

The pastoral tribes, especially the Masai, Borana, and nomads of Rudolf Province, possess large mixed flocks of

cattle, sheep, and goats which constitute their main wealth. This indigenous stock is of a poor type ; but fortunately both cattle and sheep are very susceptible to improvement by crossing, and it is already clear that hardy races can be built up, from which a considerable export trade in frozen meat, dairy produce, and wool might develop. The chief obstacle is the reluctance of the pastoral tribes to sell their animals, but this now shows a tendency to break down under contact with civilization.

In the highlands, European stock-breeding is now an important branch of farming. The grass-lands can carry a big head of stock : where the rainfall is heavy 5,000 acres will take 300–400 cattle and 3,000 sheep. Stock pays the settler best as a branch of mixed farming. It works in well with agriculture, and the areas into which the highlands are mostly divided for settlement usually contain a proportion of pasture after the best plots have been set aside for arable. More capital is required than for pure agriculture, but the final profits are higher. Settlers specializing in stock must spend at least £3,000 in establishment, after paying for their land. Those who grade-up from native animals, instead of buying native stock, must wait some time for a return. There is now a considerable head of crossed cattle and sheep in the highlands, and the best types for the country are beginning to emerge. The Rift valley, Uasin Gishu, Laikipia plateau, and West Kenya and Lumbwa districts are the chief stock regions. Pigs are becoming important, and do well.

A number of serious diseases threaten the breeder. Two of the most prevalent—the deadly East-coast fever in cattle, and the almost universal scabies in sheep—can be kept under by the regular use of the arsenical dip, which is now becoming general, and will probably be made obligatory. In 1915–16 80 dipping tanks were in use, mostly on private farms ; and native breeders in the Masai reserve had begun to realize the importance of the practice.

Much has been done by Government to encourage the live-stock industry. The Government stock-farm at Naivasha,

with about 2,500 acres of fine pasture, imports pedigree stock for grading-up, conducts breeding experiments, and holds an annual sale of pure and graded animals which is largely attended and at which very high prices are generally realized. Money was advanced in 1916-17 for the purchase of a number of stud bulls from South Africa.

There is a well-equipped Veterinary Department with offices and laboratory at Nairobi, and a staff of veterinary officers, stock inspectors, and Indian assistants. Animals brought to the Nairobi slaughter-house are inspected, and at the Rumuriti station the inspection, inoculation, and dipping of stock for sale is carried out on a large scale. Quarantine areas are declared when necessary, and the import of non-immunized stock from infected regions prohibited. All movements of stock within the settled districts and between the native reserves must take place under permit, which specifies the routes that may be followed. This system will probably be superseded by compulsory dipping; all farms and native herds containing undipped stock being placed automatically in quarantine. Inspectors can order the destruction of infected animals.

Apart from the direct trade in cattle and sheep, whether for meat or stock, the marketable products of the herds are a considerable source of wealth. The native trade in hides and skins, chiefly from Jubaland and the Masai reserve, long headed the list of exports, and has only recently been displaced by sisal. Wool, so far entirely in the hands of Europeans, is becoming important.

There is a steadily growing production in the highlands of cheese, butter, ham, and bacon, nearly the whole of which is at present consumed locally. The natives in Jubaland and elsewhere have developed an export trade in ghee.

PRINCIPAL LIVE-STOCK

Cattle

The indigenous native cattle are of the humped or zebu species. There are several varieties, the best being those of the

Lumbwa, Nandi, and Kavirondo districts. Amongst the pastoral tribes, herds of 1,000 head are not uncommon. For some time the rate of increase was slow, owing to high mortality from East-coast fever and rinderpest; but the permit-system which now regulates the movement of stock has greatly checked these diseases. Originally the purely pastoral tribes, such as the Masai and Borana, could with difficulty be induced to sell their cattle. Having little or no agriculture, milk and meat were, and are, their staple foods. To some extent this reluctance to trade persists, and most of the native cattle offered at public auctions are brought from Northern Frontier province, Jubaland, and Abyssinia by Somali traders. The Masai, however, now seem more willing to part with stock. Up to March 1916 this tribe had voluntarily contributed bullocks and sheep for the troops to the value of Rs. 23,000, and sold many more at a reasonable price.

Pure native cattle are hardy and thrifty, but bad milkers: a cow with calf seldom giving more than 2 quarts a day. The milk is rich, having about 6 per cent. of butter fat. They are remarkably susceptible to grading when crossed with pure European stock. Even at the first cross the hump and drooping quarters disappear, the make and shape is that of the European sire, and there is gain in early maturity without apparent loss of vigour. If the sire be of a good milking strain, the yield of milk is increased three- or four-fold, with a long lactation period. Cattle-breeding among settlers, which is very successful in the highlands, consists in the steady grading-up of native stock by such successive crossings with imported European strains. Ayrshires, Shorthorns, and Frieslands have proved excellent for this, and good bulls of these breeds fetch high prices. Herefords, which are fine beef-producers and hardy as to climate, have done well locally, but seem more susceptible to disease and are less popular. Ayrshire and Friesland grades are the heaviest milkers, whilst Lincoln-Red Shorthorns give the largest return of calves. The grade known as 'Guernsey-Shorthorn', i. e. native \times Guernsey \times Shorthorn, and Shorthorn in each subsequent cross, is excel-

lent for dairy-work and hard to distinguish from a pure-bred animal. At first, little attention was given to breeding for beef, but the meat shortage caused by heavy military requisitions during the war has brought this into prominence. The general desire is now to establish a good utility breed giving both beef and milk. Farmers are also giving attention to the breeding of powerful draught oxen, which are in demand for transport and agricultural work. The Masai are beginning to appreciate graded stock, and are eager to barter bullocks for pure-bred stud bulls. The best authorities agree that the natives should be encouraged to breed for meat, not dairy produce, where their slovenly and uncleanly methods would be a disadvantage.

European stock for grading are imported by the Agricultural Department and the principal breeders. A few pure-bred herds are kept and do well, but tend in time to become slow breeders or go barren. A grade cow may be counted on for a calf yearly, a pure-bred will not give more than four in five years. The import of acclimatized stock from South Africa, especially Frieslands and Lincoln-Red Shorthorns, has been found very satisfactory.

Cattle can be kept out of doors throughout the year, roaming long distances at pasture and being driven into open wire *bomas* at night. The area suited to them is very large, and the grazing so rich that cultivated fodder is hardly ever needed. Buffalo-grass, which grows abundantly on the borders of Nairobi, couch-grass or *ikoka* (*Cynodon dactylon*), and pink and white clover are among the best indigenous foods. A good stock-farm should have some trees, as cattle thrive better if able to find shade from the mid-day sun. The position of watering-places is less important. The native strains only drink once a day, and will go several miles to water if necessary. Natives belonging to pastoral tribes make good herdsmen—the Masai, Nandi, and Lumbwa being the best. They tend sick animals willingly and are gradually learning to believe in, and apply, European remedies. The majority, however, are dishonest, and a constant watch must be kept

for thefts of cattle and of milk, of which they are very fond.

It cannot be denied that East Africa is richly endowed with cattle diseases. East-coast fever is endemic over large areas, and where uncontrolled is responsible for a heavy mortality. Dipping every three days in an arsenical bath of standard strength is the best preventive. Rinderpest and pleuropneumonia are—though usually now in an attenuated form—also prevalent. Trypanosomiasis, spread by the cattle-fly (*Stomoxys*) occasionally appears in the settled districts. Black leg, anthrax, and colon bacillus break out from time to time. For a discussion of all these, and the measures taken to control them, see 'Health Conditions'.

The prices of native, grade, and pure-bred cattle have gone up rapidly in the last few years. A good native cow with calf will now (1917) fetch as much as £12, a 'dry' cow £7, a good grade cow from £20 upwards, and a trained draught ox £6. As it takes three years to produce mature grade from native stock, it is often cheaper in the end for the new settler to purchase first-cross rather than native cattle.

The following prices were obtained at the annual sale at the Naivasha government farm in March 1916 :

<i>Pure-bred Cattle</i>								£	£
Friesland bulls .	.	.	.	.	.	.	.	75	110
Ayrshire bulls .	.	.	.	.	.	.	.	60	100
Shorthorn bulls	.	.	.	.	.	.	.	85	155
<i>Grade Cattle</i>									
Shorthorn grade bulls	.	.	.	.	.	.	.	20	60
Friesland grade bulls .	.	.	.	.	.	.	.	19	37
Ayrshire grade bulls .	.	.	.	.	.	.	.	16	23
Hereford grade bulls .	.	.	.	.	.	.	.	8	13
Shorthorn grade cows	.	.	.	.	.	.	.	26	30
Ayrshire grade cows .	.	.	.	.	.	.	.	25	30
Cross Guernsey-shorthorn cows	.	.	.	.	.	.	.		34

In 1917 the estimated number of cattle in the Protectorate was 1,943,000. The great majority of these were in the hands of the natives.

Sheep

Large numbers of sheep are kept by the natives, especially the Masai, whose flocks are estimated at 1,653,000, and by the Jubaland tribes. They are all of the African fat-tailed species, with coats of hair. The Masai sheep are the best strain in the country, carrying a thick coat of long, dark, chestnut hair. They mature slowly. The best at nearly two years old scale about 80 lb. This is the best stock for grading, either for wool or mutton, and is adaptable to any district. The sheep of Jubaland (*Ovis pachycera*) represent a distinct variety with black heads, fat rumps, short hair coats, and blunt tails. The Karamojo and Turkana strains, which have some Persian blood, are smaller and well shaped, but difficult to acclimatize in the highlands.

Under proper management sheep-farming is profitable to Europeans, but the area suited to it is limited, as a rainfall below the average and a fine type of grass are essential to success. With the general grazing-down of the coarse grasses by cattle and consequent growth of a finer turf, the sheep districts will be enlarged. At present, cattle must be kept on the sheep farms—a good proportion being 50 cattle to every 500 sheep—in order that the grass may be eaten down to the quality of pasture at which sheep will thrive. The Rift Valley is the best sheep-country, especially the region from Elmenteita to Naivasha. West Kenya, the Laikipia plateau, Molo, and parts of the Uasin Gishu are also suitable. In all these the sheep pasture is excellent, and will often carry two or more to the acre. To the settler, the native sheep are utterly useless, except as material for grading-up. Shropshire, Leicester, Suffolk, and Welsh rams have all been used for this purpose; but the favourite and undoubtedly the most valuable are Australian merinos, which, though small, exceed all the others as wool getters. The Suffolk grades are, so far, the best for mutton, a $\frac{3}{4}$ to $\frac{7}{8}$ cross producing a mutton wether with about a 45-lb. carcass. Owing to the large local demand for meat, a number of Romney Marsh rams have lately been

imported for this purpose ; and grade mutton rams are being introduced into the Masai reserve, to prepare the way for a possible export mutton trade in the future. On account of the ravages of scabies, natives should be encouraged to breed up for mutton rather than wool.

According to recent Government Farm reports the Merino or Lincoln-Merino grades do best and are more hardy than those with Suffolk or Shropshire blood. First cross Lincoln-Merino on native, and then Merino on successive crosses, are excellent. Crosses of Suffolk and Shropshire on native, with Suffolk on successive crosses, make a fine mutton sheep, with good paying coarse wool, but are very subject to worms. Grade Shropshires have also done well. They mature early and make good meat.

There are two varieties of Australian Merino : the robust-woolled and the small fine-woolled. So far, the robust-woolled of the Wangella type has been the favourite and is probably the most suited to the Rift Valley ; but the fine-woolled breed may be found to thrive better on the cold and wet uplands, such as Uasin Gishu. The country is undoubtedly suited to the breeding of pure Merinos, which will thrive quite as well as graded sheep and maintain their vigour unimpaired. The flock kept at the Government Farm at Naivasha has done well ; and the preliminary expense of stocking is the only objection to the immediate setting up of an imported flock, instead of slowly grading up from native sheep. A farmer with a small holding—say 5,000 acres of pasture—and sufficient capital, would probably do best to import pure Merinos at about £2 a head with the prospect of a prompt return, instead of buying native ewes at 7s. 6d. to 10s., and slowly grading up. Whereas the average wool-clip of a second-cross sheep may be 6 to 8 lb., and of a third-cross 7 to 10 lb., that of a pure flock Merino will be 9 to 12 lb.

With careful management, two crops of lambs can be had yearly ; in April-May and October-December. Shearing takes place in December and January. Native boys make good shearers. A flock of 500 can be sheared for Rs. 15. The

cost of running a flock of 2,000 sheep has been estimated at 1s. a head a year. The loss from disease is fairly high, but should not exceed 6 per cent.—excluding unweaned lambs. A total loss of about 10 per cent. from all causes, including lambs, must be looked for.

The most troublesome diseases are scabies, which is universal; intestinal worm, specially prevalent on ground that has been fouled by zebras, strongylosis, and foot-rot. For a discussion of these see 'Health Conditions'.

The following current prices obtained in 1916-17 :

	£	s.	d.	£	s.	d.
Native sheep	10	0				
Grade ewes	10	0	to	16	0	
Hoggets	13	4				
Wethers	16	0	to	1	0	0
Grade rams	17	0	to	2	0	0
2nd and 3rd cross grade mutton rams	9	0	0 to	12	0	0
Pure Merino stud rams	5	0	0 to	12	0	0
Pure Merino flock rams	7	0	0 to	8	6	8
Full-mouthed Merino stud rams	5	0	0 to	7	13	4
Pure Merino ewes	12	0	to	15	4	

In 1917 the estimated number of sheep in the Protectorate was 3,515,000, the immense majority being of native breeds.

Goats

Goats are largely kept by the natives, usually in mixed herds. They are a good type of animal, generally running larger than the sheep, with white or brown and white short coats and large horns. The skins are of value, and there is a growing trade in them, chiefly from the Somali and Borana tribes to Meru and Nyeri.

The Agricultural Department has imported some Angora rams during the last few years, with a view to grading-up the native stock. So far the experiment has been very successful, a marked improvement being seen in each successive cross; and the grade animals have given a good quality mohair, selling in London for 1s. per lb.

Goats are subject to several diseases, of which contagious pleuro-pneumonia is perhaps the most serious.

At the Naivasha stock sales, pure Angora rams have fetched about £1 8s. each, grade rams 17s., and grade ewes 11s. to 13s.

In 1915 the total number of goats in the administered area of the Protectorate was 4,023,000.

Pigs

The conditions for pig-breeding in the highlands are very favourable ; and it is doubtful whether there is any other country where bacon can be produced so cheaply. A bacon-pig weighing 200 lb. costs Rs. 32 to produce, and sells for Rs. 50 ; as capital can be turned over twice yearly by fattening two litters, this gives a profit of 50 per cent.

As there is no native breed of domestic pig, stock must be imported, and good strains are essential to success. Long Blacks and Berkshires are found to do best, though Tamworths are also suitable. A Long Black sow mated to a Berkshire boar gives the most profitable cross. Pigs can be fed on the marshes to a certain extent, but require ample fattening foods if they are to do well and mature quickly. Maize and potatoes, which are suited to this purpose, are cheap ; and barley, another excellent pig food, grows well in the highlands. Grazing areas must be kept fenced, as much of the open pasture is infected with worm by zebra and antelopes, and the risk of swine-fever, believed to be transmitted by ground fouled by bush-pigs, is an ever-present danger. This disease is virulent where it appears, but is fortunately becoming less common. It has been known to wipe out an entire herd. Pigs work in excellently on a general-purpose farm, especially where there is dairying, and are rapidly becoming one of the most lucrative industries of the Protectorate. They do specially well in Lumbwa, where food-stuffs can be bought cheaply from the native reserve, and also flourish on the Uasin Gishu, where they are on the increase. In March 1915 the total number kept was about 3,900.

Horses

Horse-breeding is now fairly established in the highlands above the 5,500 ft. line. There are a number of thorough-breds in the Protectorate, but the prevalence of horse-sickness and lymphangitis at present precludes the development of horse ranching on a large scale. When these diseases are brought under control it is anticipated that the Uasin Gishu, upper Rift Valley, and other parts of the highlands will prove well suited to this purpose. Owing to the presence of tsetse no horses can be kept in the coast or midland zones. Until about 1910 practically all the horses bred in the Protectorate were sired by Arab stallions, which produced a good type of animal, and were specially successful when crossed with Abyssinian ponies. Recently, however, there has been a tendency to use thorough-breds, a number of which have been imported. One Irish hunter stallion 'Royal Fox' is kept at the Naivasha Stock Farm for the use of settlers, and in 1915 had already served 220 mares. An Arab stallion is also kept, and chiefly used for crossing native donkeys. Imported stock has come mainly from South Africa; and to a less extent from England and India. Well-constructed horse-boxes are now available on the Uganda railway, in which animals can be safely conveyed through the fly belt.

There is a good and steady market for thick-set ponies of about 14.2 hands, with dense bone, good constitution, and staying powers; and a good strain of this kind is being developed. Such horses are useful for light farm purposes, safaris, polo and other sport, and some military requirements.

Horses need care. They should not be turned out before 8 a.m. and must always be brought under cover by 5.30 p.m. Where this is the rule, the risk of horse-sickness is greatly diminished. They must be well groomed and all ticks removed daily. Good stabling is essential. The Masai and Akamba make the best grooms. The danger of disease is ever present. The worst scourge is now lymphangitis, which

has for some years prevailed on the Uasin Gishu. The mortality from this disease has in the past reached 90 per cent. The rigorous inspection of animals commandeered during the war, and destruction of infected beasts has, however, reduced it, and comparatively few cases were reported in 1916. Horse-sickness is also serious, and still causes considerable mortality.

The following current prices obtained in 1913 :

	£
Somali pony	20 to 30
East African country-breds	30 to 60
South African or East African brood mare	50
South African or East African stallion	80

In March 1915, the estimated number of horses in the Protectorate was 1,700.

Donkeys and Mules

Donkeys are used to a considerable extent by the natives. Mules, which are less common, are mostly imported from Abyssinia. They are hardier than ponies, and settlers find them useful for light farm-work. During the last few years, experiments have been made at the Naivasha stock farm in crossing the native donkey with the imported Catalonian jackass. The resultant half-breed is a nice large animal, and is in great demand. A steady grading-up of the native stock from this strain is now proceeding. Mules are also being bred, from the native donkey crossed with an Arab stallion. The principal diseases affecting donkeys and mules are lymphangitis, trypanosomiasis, and a peculiar form of anaemia.

The following prices obtained in 1916 :

	£	s.	d.
Native donkey mares	10	15	4
Half-breeds (average)	8	5	8
Grade Catalonian jackasses	9	8	4

In 1915 the estimated number of donkeys in the Protectorate was 20,000, and of mules, 1,700.

Camels

Camels are the common transport animal of Jubaland. They are kept mainly by the nomad Somalis, and are their chief means of subsistence, supplying meat, milk, leather, and transport. The principal camel-breeding district is the country round Eil Wak and Wajheir, where there are large herds. Few are bred south of the Lak Dera. Those used in south Jubaland must generally be obtained from Italian Somaliland; but the Italians charge an export duty of Rs. 7-50 per camel, and there is also an import duty into Jubaland of 10 per cent. *ad valorem*. The demand for these camels greatly exceeds the supply; in fact both military and civil authorities are generally obliged to hire from Arabs and Somalis at R. 1 *per diem*. The Government allowance for an official travelling in Jubaland is 25 camels. The local breed are baggage animals only; but some riding camels have lately been imported from Aden. The camels of Wajheir and the upper Juba have dark-red coats; those from Italian Somaliland are nearly white. If in good condition, the hump is large and firm. The principal disease affecting them is 'Jubaland camel disease', a form of trypanosomiasis believed to be spread by both tsetse and gadflies. There are both acute and chronic forms, the first killing in a few weeks. Camels cannot be used on the banks of the Juba during and after the rains, when tsetse prevails. Camel-mange is also prevalent at this season.

The average price of a baggage camel in the interior is £2-£3; at Kismayu, £5-£6.

The estimated number in the Protectorate in 1915 was 10,700.

Ostriches

Most of the country below 6,000 ft. in altitude, especially where the soil is sandy, is suited to ostrich-farming. Cotton soil is bad, and so are cold and damp districts. The industry began well, and was expected to be of great importance. The Game Ordinance provides for the registration of ostrich

farmers and their agents, who are empowered to capture live birds, and take eggs. Naivasha and Machakos seemed likely to be the head-quarters of the ostrich industry. The slump in the feather trade, however, has given it a severe set-back. In 1915, about 1,400 birds were being kept in captivity, but at present (1919) it is doubtful whether any remain.

Poultry

Poultry-farming is still in the experimental stage. As a side-branch of general farming it has proved successful, but not so far as a single venture. The cost of importing good birds is very high; and vermin-proof fowl-houses are essential. There is now plenty of good stock in the country; the most popular breeds being White Leghorns, Rhode Island Reds, and Buff Orpingtons. Native birds are poor in quality, but plentiful in some localities. In the Takaungu district of Seyidie Province there is a brisk native trade in chickens and eggs. Fowl-cholera and Kikuyu fowl disease are prevalent and cause heavy losses.

Silkworms

These are being tried at the Kabete experimental farm, and promise well. They are fed on castor-oil leaves. The export of raw silk began in 1913-14, when 21 cwt. fetched £60.

Bees

Bees (*Apis mellifera* var. *adamsoni*) represent a considerable source of potential wealth. They abound in the forests, and are partially domesticated by the Kikuyu, who hang hives for them in the trees. These hives are made from a piece of hollowed trunk of some soft-wooded tree, with a split board at each end, and are often hung as high as 50 ft. from the ground. Practically all the bees of the country live in this state of semi-domestication, the swarms entering the hives of their own volition. The bees, which are yellow or fawn in colour, are much tamer than the Cape bees. The yield of

honey is large and of good flavour, and is a favourite article of native food. During recent years a few foreign queens have been introduced, but there seems no occasion for this.

ANIMAL PRODUCTS

Meat

It is considered that the export of frozen meat might become a large industry, were a sufficiently regular supply of slaughter animals assured to warrant the erection of factories ; and this is one of the ultimate aims in the grading-up of cattle and sheep. Most of the native reserves are fully, if not over stocked with cattle ; and it is estimated that the Masai reserve alone could produce 50,000 slaughter oxen yearly, and the other reserves as much. The natives, however, are still somewhat averse from parting with oxen, except in exchange for stud bulls, or for cows, which are only available to a small extent from the Northern Territories ; and while this remains the case, it is unlikely that an export trade will develop. During the war the Masai have shown signs that they are losing some of their reluctance to trade, and have both given and sold large numbers of animals for the use of the troops. It has been suggested that they should be encouraged to grade-up their sheep for mutton production.

At present, the local demand for meat, especially mutton, exceeds the supply, chiefly owing to the great destruction of slaughter animals for the troops ; but settlers are now giving increased attention to beef production. Some indication of the potential meat resources of the country can be obtained from the fact that in 1915-16, 35,434 cattle, 128,123 sheep, and 16,327 goats were supplied to the troops, in addition to the normal civilian consumption ; and in 1916-17, 27,954 cattle, and 60,470 sheep and goats. In the following 3 years' returns from Nairobi slaughter-house, the increase in bullocks killed in 1914-15 is also due to military needs.

	<i>Bullocks.</i>	<i>Sheep and Goats.</i>	<i>Pigs.</i>
1912-13	1,057	30,482	—
1913-14	1,567	35,957	102
1914-15	4,749	30,965	337

Bacon

There are at present two bacon factories in operation, and the demand for the products is on the whole good. Only first-class bacon, however, commands a market. There is no sale for second-grade stuff. A large bacon factory with cold storage is working at Escarpment. Its output is about 30,000 lb. monthly, and as much again is cured in the highland farms. A small export trade in ham, bacon, and lard to South Africa, England, and India had begun before the war. Liners calling at Mombasa were also supplied. During hostilities all the needs of the troops were met locally. Subsidiary bacon factories and a canning plant are projected, and the industry seems likely to become important. Its future depends on the setting-up of co-operative factories, and scientific pig breeding with elimination of poor stock.

Dairy Produce

Dairying should become a very profitable pursuit in the highlands, were creameries and cheese factories started on modern lines. Though the native cow is a poor milker, her milk is rich in fats; and in graded stock the yield is greatly increased. The grade known as Guernsey-Shorthorn is the best for this. There is a large local demand for cheese and butter, and when this has been met there seems no reason why an export trade should not be built up. Lumbwa is at present the chief centre of dairying. The Co-operative Creamery, opened in 1912, has an output of 6 tons of cheese and butter per month. There are also important dairy farms in the Nairobi and Naivasha districts, and all are giving a handsome profit.

During the war, the Government Farm at Kabete became the milk-supply depot for the military hospitals in the Nairobi

district. A daily average of 100 gallons was produced, 30,895 gallons being distributed in the year 1916-17.

Ghee (cooked native butter) is also made in considerable quantities in Jubaland and elsewhere. The value of the exportable surplus during the last 4 years for which figures are available is :

1912-13.	1913-14.	1914-15.	1915-16.
£10,638	£5,063	£3,137	£6,901

Wool

Wool-production has made rapid strides during the last few years, and promises well. The clip both of pure Merinos and grade-sheep is of good quality, comparing well with that of other countries, and fetches a satisfactory price on the English market. The weight of the fleeces is good, and the quality of the best grade Merino wool equal to much pure Merino.

The following are the weights of the fleeces (10 months' growth) obtained at the Naivasha stock-farm in 1914 :

	lb.
Stud Merino ewes	12 to 20½
Flock Merino ewes	5 to 11½ (average 8½)
Merino rams	12 to 28
4th grade Merino	4 to 8 (average 6)
3rd grade Merino	3 to 8 (average 6)
2nd grade Merino	3 to 6 (average 4½)
4th cross native by Lincoln by Merinos. This gave a nice robust wool with a long staple	3 to 9

When we remember that the native sheep has a hair coat, it will be seen that fleece-development by grading is fairly rapid.

The prices obtained compare favourably with those of other countries. In 1915 grade wool fetched 10*d.* and 10½*d.* per lb. and pure Merino wool 11*d.* In 1916, ¾ Merino wool touched 1*s.* 7*d.* a lb. in London. As the clip of Merinos is larger than that of grade sheep and they are perfectly hardy in the highlands, many sheep farmers think them more profitable than grade flocks for those who breed for wool and

can afford the initial outlay. The wool industry, however, has hardly yet passed the initial stage, and the limited amount of pasture suitable for sheep walks will probably prevent it from assuming large dimensions. Exports have so far been to the United Kingdom. The following are the last available figures :

	1912-13.	1913-14.	1914-15.	1915-16.
Amount (cwt.) . . .	1,689	2,082	2,241	2,869
Value	£7,908	£9,718	£8,261	£10,061

Mohair

The crossing of native with Angora goats initiated some years ago at the Naivasha stock-farm is producing grade animals bearing good mohair coats. The export of mixed mohair has begun in a small way and 1s. a lb. has been obtained on the London market.

Hides and Skins

There is a large trade in bullock hides and sheep and goat skins ; practically the whole of which come from the native herds. In 1915-16 these represented 32 per cent. of the total exports of the Protectorate and were valued at £104,764. Up to this date they stood first on the list of exports, and are now only exceeded by sisal. In 1915-16, 19,879 cwt. of bullock hides valued £90,896 were exported, 106,779 sheep skins valued £1,436, and 279,424 goat skins valued £11,843.

Ivory

Up to 1903, when the exports were valued at £24,000, ivory was a staple product of the country ; but it has long been dwindling and is now negligible. The steady fall since 1910 has been caused partly by the enforcement of the Game Ordinances and partly by the growing rarity of elephants. Poached ivory is confiscated and sold by auction from time to time, after which it is exported. An appreciable quantity which had been buried by the natives, has been found in the Northern Frontier district, Turkana, and Suk, and sent

down for sale. The value of shipments sank from £28,721 in 1909-10 to £8,764 in 1913-14, and £1,887 in 1914-15. There are no later returns.

Beeswax

Of the enormous amount of beeswax produced (see 'Bees') the greater part is still wasted. Were some regular system of collection introduced, it might become an important source of revenue. The exported value before the war fluctuated from £8,968 (1911-12) to £8,124 (1914-15). During hostilities it dropped considerably but will probably regain its position with the return to normal conditions.

FISHERIES

The Fisheries of the Protectorate are controlled by rules made under the Fish Protection Ordinance of 1908. On Victoria Nyanza, non-natives wishing to fish for sale or barter must pay a registration fee of Rs. 75 for the season from July 1, or Rs. 150 before July 1. Both lake and sea-going native fishing-craft must have a licence, price Rs. 3 for boats and Rs. 2 for canoes. For fishing-stakes, fees not exceeding Rs. 6 must be paid.

The most important fishery is that at Kisumu, which is estimated to bring in £4,400 per annum. The fleet consists (1916) of two motor-launches owned by Europeans, and 34 boats and canoes. Fresh fish is sent to Nairobi in ice, and a brisk trade in dried fish is also carried on. A small fish called nyngu is the most profitable catch. Bream, barbel, cat-fish, mud-fish, and lung-fish or mamba are also obtained. The last (*Protopterus aethiopicus*) grows 5 ft. long and is good eating, but dreaded by native fishermen on account of its vicious bite. Fishing on Lake Victoria is still limited (1917) by the sleeping-sickness regulations.

On the coast, where the fishing is exceedingly good, the principal fisheries are based on Mombasa, Malindi, and Lamu. The Mombasa fleet consisted in 1916 of about 149 boats and

canoes. The catch, averaging 375,000 lb. yearly, was valued at £3,000. It comprises over 50 different kinds of fish, including mullet (mkisi), mackerel, sting-rays, sardines, sharks, crabs, lobsters, and prawns. Garfish up to 4 ft. long are caught at the harbour entrance. Their beaks sometimes inflict nasty wounds. The flesh is delicate eating. The best season is between November and March when the big fish come inshore. After the south-west monsoon breaks, little can be caught off Mombasa itself ; but fishing continues in Malindi bay, where the big fish enter to feed in the calm water on fry ; and fish is obtainable in Mombasa market throughout the year. The native fishermen use hooks, nets, and traps. The larger fish give excellent sport, the general method being trolling, and the best bait a sardine.

The Malindi fishery consisted in 1916 of 64 boats and canoes, and had an estimated value of £150 a year. Small king-fish or nguru up to 15 lb. are caught there during the monsoons and in the north-east monsoon the koli-koli or bayardo, running up to 64 lb. The most profitable species is the tase, worth about £70 a year. Papa and changu are plentiful. Sardines swarm in the bay during the monsoons, and attract the larger fish.

The Lamu fisheries employ 106 boats and canoes, and have an estimated value of £1,230. Shark, mullet, and skate are common. The large king-fish, nguru mtwana, is plentiful in November and December, and is caught by trolling a sardine.

The Vanga fisheries employed in 1913 over 500 boats and canoes, but were only worth about £300 a year. The catch includes koli-koli, changu, nguru, and many coarse fish, also prawns. The fishing of the Takaungu subdistrict is more valuable ; 22 boats and canoes bringing in about £500 a year. The chief catch is the amoy, averaging 150 lb. a day. Sharks, red mullet, and many other species are common.

There are no particulars of the fisheries off the mouths of the Tana and Juba rivers ; but coarse marine fish abound in these waters, especially nguru, sharks, and saw-fish. The dolphin or fulusi may be caught off Tanaland in February and

March, by trolling a white rag from a swift-sailing dhow. It moves in shoals, and runs up to 30 lb, giving excellent sport. Good lobsters and prawns are obtained on the Jubaland coast.

MINERAL RESOURCES

Soda

This will in future be one of the chief exports, and an important source of wealth. It is obtained from the Magadi soda lake, lying north of Lake Natron near the southern frontier. The soda deposit, which is for all practical purposes a solid one, has been worked since 1911 by the Magadi Soda Company, who have a concession of 340 square miles, the exploited soda area being 44 square miles. A railway has been constructed, linking Magadi with the Uganda Railway. The early yield was sold for native use in quantities of 300 to 500 cwt. to German East, Zanzibar and Arabia. The first large consignment, 5,000 cwt., valued at £13,333, was shipped to the United Kingdom in September 1914. The war then caused all work to be suspended, the Magadi line being taken over by the military. Only 1,540 cwt. as sample consignments were shipped in 1915-16. Had war not broken out, it was estimated that the completion of the railway would have brought about an export of at least 50,000 tons; and East Africa may well become in the future a main source of the world's supply of washing-soda. It is said that further important soda deposits have been located in the north of the Protectorate.

Mica

At Mukaa, in the Machakos district, an area of metamorphic rocks containing pegmatite veins which carry mica has been opened up. Other deposits have been found in the Mweru district. In 1914-15 the total number of claims pegged out was nine, and the area covered 362 acres. Considerable activity went on till the outbreak of war, when it temporarily ceased, owing to the withdrawal of European employers and super-

visors on active service. The prospects of the industry, however, are promising.

Mica was first exported in 1913-14, when 14 cwt. fetched £219. In 1914-15, 59 cwt. fetched £1,275 ; and in 1915-16, 45 cwt. fetched £13.

Other Minerals

A deposit of fuller's earth has been discovered in the Rift Valley, east of Kedong ; but not in sufficient quantity to be commercially profitable.

There are deposits of graphite, intimately mixed with a soft schist rock, at Tulimani Hill, Machakos District. The rock sometimes contains as much as 26 per cent., but it is of an amorphous character, and so far there appears to have been no attempt to exploit it. Graphite mixed with quartz and clay is also met with in the coastal belt, and near Lake Victoria.

Iron ore is found in several districts, some of the deposits being extensive. Round Berkeley Bay the ore occurs in pockets 40 yds. in diameter, which are scattered in a bed about 20 ft. thick. The ore is a red hematite, containing phosphorus and silica in appreciable quantities. It might be worth extraction, were transport improved and coal difficulties solved.

With the above exceptions there is so far little or no indication of mineral wealth in the Protectorate.

CHAPTER XII

TRADE, MANUFACTURES, AND LABOUR

Imports—Exports—Re-exports—Transit—Local trade—Manufactures—Banks—Labour.

The value of the total trade of British East Africa can be stated only approximately owing to a difficulty presented by the official figures in which no distinction is made between commodities imported for consumption in British East Africa and those destined for Uganda and elsewhere. For the purposes of the customs authorities who collect the duties on behalf of the governments of both Protectorates, the distinction is not necessary. A rough estimate, however, of general imports for consumption in East Africa alone, including trade imports, government stores, railway and telegraph material, gold, specie and rupees, but exclusive of goods in transit by sea and imports for the Expeditionary Force can be made.

Thus a comparison of the values of imports and exports for the statistical year immediately preceding the war (1913-14) and the latest year for which statistics are available (1915-16) is as follows :

	1913-14.	1915-16.
	£	£
Imports, general	2,222,300	1,462,100
In transit by sea	202,723	71,693
Expeditionary Force.	—	429,198
Exports	443,624	329,519

The gradual expansion of trade in British East Africa and Uganda has synchronized with the advance in construction of the Uganda railway, which first began to exercise an effect to a substantial degree in 1911. The fact that the volume of trade passing to and fro through East African ports increased in four years from £1,769,695 in 1909-10 to

£4,880,267 in 1913-14 is a general indication as to the flourishing condition of trade in those regions during the period immediately preceding the war. As was to be expected in a country in time of war and within the zone of military operations there was a considerable shrinkage in the trade. The elimination of enemy trade and of export houses in enemy hands, the calling up of farmers for service, the inability of home factories to fulfil orders, and heavy freights were all contributory causes. In 1914-15 exports from British East Africa fell in value by over 33½ per cent. and imports by about 25 per cent. ; in the following year the value of exports made a slight recovery due in some degree to high prices. Imports fell in value by a further 12½ per cent.¹

IMPORTS

Generally it may be remarked that at present British East Africa is dependent to a great extent on overseas supplies, little or nothing being manufactured in the country. As yet it is partly dependent on imports for feeding its European and Asiatic populations, but as regards certain foodstuffs such as coffee, meat, butter, eggs, vegetables, cheese, bacon, fruit, beans, and mealies the colony has tended to be self-supporting ; in wheat and flour partly so. It is thought that in the near future it will be possible to manufacture from native grown products such commodities as beer, soap, oil, and tanned leather. At present the chief commodities in demand are cotton piece-goods, provisions, hardware, machinery, soft goods, bags and sacks, building materials agricultural implements, tobacco, and wines and spirits. There is also a growing demand among Indians and natives as well as Europeans for such commodities as bicycles and sewing machines.

In the review of the various imports which follows, the figures refer to the total amounts imported through British East African ports.

¹ In 1916-17 exports increased in value by £257,525, an increase over the figure of the previous year of 78 *per cent.* and the highest on record. There was a corresponding increase in the value of imports.

Cotton textiles constitute the most important import into the Protectorate. In 1915-16 27,691,829 yds., valued at £451,022, representing 26 per cent. of the total trade imports were imported. A little short of half was consumed in the Protectorate alone. The import of this year is considerably less than it was in 1913-14 when the total was 38,114,639 yds. valued at £570,598. These fabrics have been divided for statistical purposes into unbleached, bleached, printed, dyed, and cotton blankets. The variety imported in the largest quantity is the unbleached, which appears to be the same as *americani* or coarse calico so much in demand in Uganda. This commodity in 1913-14 came chiefly from the United States and India and moderate quantities from Italy, Great Britain, and Austria. In 1915-16, when the total importation was less, the United States still led the way, but with a decreased share, while India maintained the second place with a considerably increased amount. In the intermediate year 1914-15, when the total import was comparatively small, the United States temporarily lost the first place but regained it in the following year. Of the other varieties dyed fabrics are the most important, and of these the United Kingdom in 1915-16 supplied about 70 per cent. The United Kingdom occupies the first place in the trade in printed and bleached fabrics, but here Holland is a close second. In the case of printed goods, however, the scarves used by native women originate in Manchester, but are printed in Holland, whence they are shipped to East Africa. It is noteworthy in connexion with the trade in cotton fabrics as a whole, that during the war the United Kingdom has forged ahead of the United States, which now occupies the second place with India not far behind.

The import in 1915-16 next in importance is provisions, but its high position was due to the presence of the Expeditionary Force ; in 1913-14 it occupied only the fourth place. The chief commodities included under this head are bacon, ham, butter, cheese, condensed milk, alcoholic drinks, mineral waters, preserved meats, ghee, and canned and bottled

victuals. The United Kingdom obtained the bulk of this business, and during the war its share has increased.

Grain (mostly rice) from India is imported in considerable quantities. Fair quantities of flour and wheat meal were imported, also comparatively small amounts of wheat, pulse (*dhall*), and maize. The importation of foreign flour for local consumption was in 1915-16 much the same as in 1913-14. It comes from India chiefly.

In 1915-16 there was a large increase in the importation of spirituous liquors due to a desire to anticipate an increased duty and also to the needs of the Expeditionary Force. Ale and beer, which was originally supplied in its largest quantity by Germany in 1915-16, came from South Africa and the United Kingdom. In 1913-14 South Africa's share in the trade was negligible. Most of the whisky comes from the United Kingdom; the bulk of the wine and brandy from France.

As compared with the total amount in 1913-14, there was in 1915-16 a considerable drop in the amount of sugar imported; but owing to an increase in the average price, which was in 1915-16 24s. 8d. per cwt. as against 13s. 8d. per cwt. in 1913-14, there was a very large increase in the total value of the import. One reason for the increased price is the elimination from the market of Austria-Hungary, the source of about two-fifths of the pre-war supply. In 1915-16 Java furnished the bulk of the supply, and Egypt, Mauritius, and Portuguese East Africa the remainder between them.

As a result of the decline in building activity during the war there has been a corresponding falling off in the importation of building materials, which at one time came second in the list of imports. The United Kingdom possessed the entire trade in galvanized iron sheets and supplied the bulk of the cement. Most of the deal and pine came from Norway and Sweden while India supplied teak. Other imports under this head were bricks, clinkers, tiles and slates for roofing, and iron and steel girders, beams, joists, and pillars. The prices of these materials have increased enormously.

Machinery, agricultural, industrial, and other kinds which before the war was being imported in increasing quantities, fell away during the war as the result of a diminished production and greatly enhanced prices. The United Kingdom was responsible for four-fifths of this import.

A decreased importation of agricultural implements followed on the interference of the war with farming operations, but with the advantage of the elimination of German competition from a trade in which it occupied the first place. The bulk of these articles are now supplied by the United Kingdom and the rest by the United States.

In connexion with the importation of matches, the total value of which has greatly increased since the outbreak of war as a consequence of higher prices, it is interesting to note that Japan's attempt to enter the field failed owing to the inferior quality supplied.

A class of trade which has fallen off during the war is that of vehicles of all kinds, with the additional disadvantage that the share of the United Kingdom has diminished while that of the United States has increased.

The importation of petroleum products, namely, kerosene and petrol, has increased during the war. The United States and Egypt were chiefly responsible for the kerosene, with Sumatra some way behind. Nearly all the motor-spirit was supplied by Egypt.

Bags and sacks for packing produce are as in Uganda in demand in British East Africa. This demand has, with the decline in the export trade during the war, diminished. These are practically all supplied by India.

There is a growing demand among natives for articles of European civilization such as soap, of which nearly the whole is supplied by the United Kingdom, and for tea, almost all of which comes from India. The importation of these two commodities has not suffered greatly as a result of the war.

The import of salt declined considerably in the first year of the war but recovered in 1915-16. Aden is the chief source of the supply.

Of the import trade entering British East African ports, 42 per cent. was in 1913-14 in the hands of the United Kingdom, 20 per cent. emanated from British possessions and 37 per cent. from foreign countries. By 1915-16 the value of the share of the United Kingdom had increased by nearly £50,000, but relatively it has diminished by 2 per cent., while the trade of the British possessions has increased by 6 per cent.; trade in foreign hands has slightly diminished. What little remains of trade of enemy origin, which in 1913-14 amounted to about 12 per cent. of the whole, consists of merchandise imported from stocks in hand in the United Kingdom and British possessions.

Both Holland and the United States have increased their trade, the former exporting more blankets, tobacco, and cotton piece-goods, while the United States has secured the market for grey sheetings previously in the hands of Austria. The importation of Dutch goods, which were introduced to a large extent through German firms in Mombasa, fell off when these were closed down. The recovery in the last year under review (1915-16) was due to the fact that Dutch goods began to be imported through British firms.

Except in the case of certain commodities such as whisky, paraffin, timber, corrugated iron, and cotton piece-goods, of which large stocks were held by a number of big importing houses, importation was done directly from overseas. Apart from the class of firms above mentioned, among whom were Americans and before the war, Germans, no big firms of warehousemen or suppliers from stocks existed in the colony.

EXPORTS

Originally, exports from British East Africa consisted chiefly of rubber and grain from the coast territories and ivory from the interior. In 1900 hides began to be exported in substantial quantities and later shipments of copra were made. As the railway extended inland and the fertile land of the highlands was brought under cultivation, agricultural products began to figure in the list of exports and the total

trade swelled enormously until the outbreak of war, when it received its first check.

The table on the opposite page is a comparative statement of the quantities and values of exports for the statistical year immediately preceding the outbreak of war and the latest year (1915-16) for which statistics are available. The figures refer to the produce of British East Africa alone.

The export of hides and skins has quintupled in value in the decade ending in 1916 and has for several years occupied a prominent position in the list of exports. In 1915-16 it headed the list and constituted 32 per cent. of the total. Just previous to the outbreak of war prices were rising steadily and afterwards increased rapidly until steps were taken by the Home Government to control the market for both raw hides and leather. Previous to the war the United Kingdom and France were large purchasers of hides; in 1915-16 Italy took 60 per cent. of the exported weight. In 1913-14 the United States was the largest buyer of skins. Since the outbreak of war skins have been diverted to the United Kingdom and British possessions, chiefly India, Egypt, and Zanzibar.

Fibre exports have recently grown in importance and are expected eventually to head the list. For statistical purposes the export is divided into sisal and other sorts. Before the war the price of sisal was from £16 to £25 a ton. During the war the 'controlled' price for the best quality rose as high as £99 per ton, though this price was not necessarily obtained. Early in 1919 £65 per ton was obtained, but the future of the market is uncertain. One authority in 1919 referred to a falling off in quality compared with the product of the Tanganyika Territory. A considerable reduction in price as a result of increased production and the lowering of freights was anticipated.

The export of millet and maize has as a result of the consumption of these commodities by the Expeditionary Force and lack of railway facilities fallen off very considerably. In evidence given before the Economic Commission in 1917

	1915-16.		1913-14.	
	Quantity.	Value.	Quantity.	Value.
		£		£
Animals :				
Camels }	9,783 (No.)	11,671	—	—
Cattle }				
Goats }				
Wild }				
Beeswax	662 cwt.	3,707	1,205 cwt.	7,901
Borities (rafters)	495,363 (No.)	8,264	511,024 (No.)	6,479
Carbonate of soda	1,546 cwt.	1,724	322 cwt.	1,200
Chillies	52 "	158	9 "	13
Coconuts	306,054 (No.)	867	121,700 (No.)	446
Coffee	6,028 cwt.	17,297	5,501 cwt.	18,502
Copra	9,774 "	8,433	31,725 "	35,587
Cotton	106,354 lb.	2,920	134,875 lb.	5,476
Cowries and other sea shells	3,442 cwt.	534	6,254 cwt.	1,190
Fibres (sisal)	46,407 "	74,660	21,467 "	12,525
" (other sorts)	3,338 "	2,381	704 "	4,083
Flax	438 "	256	—	—
Ghee (cooked butter)	1,534 "	6,901	1,162 "	5,063
Mica	45 "	13	14 "	219
Grain :				
Millet	330 "	94	2,001 "	437
Maize	8,421 "	1,855	189,855 "	34,715
Beans and peas	12,211 "	4,939	34,405 "	13,437
Sim-sim	44,867 "	25,343	76,198 "	58,564
Pulse	10,673 "	4,614	7,150 "	3,534
Rice (paddy)	5 "	3	44 "	12
Other sorts	18 "	5	817 "	524
Gum copal	497 "	1,213	692 "	1,711
Ox-hides	19,879 "	90,896	24,974 "	116,927
Hams and bacon	—	—	47 "	272
Ivory	152 "	7,946	132 "	8,764
Mangrove bark	3,012 tons	4,624	8,062 tons	8,062
Wattle bark	—	—	202 "	1,917
Oil (sim-sim)	2,823 gall.	399	6,492 gall.	848
" (coconut)	16 "	3	26 "	5
Oil cake	123 cwt.	22	178 cwt.	36
Ostrich feathers	104 lb.	145	1,118 lb.	1,609
Potatoes	12,307 cwt.	3,478	48,858 cwt.	6,716
Rubber (plantation)	247 "	2,307	687 "	6,229
" (wild)	253 "	1,774	478 "	4,303
Seeds (cotton)	2,197 "	450	2,028 "	438
Silk (raw)	—	—	2,364 lb.	60
Skins (sheep)	1,430 cwt.	1,436	1,990 cwt.	2,841
" (goat)	3,742 (No.)	11,843	6,762 "	25,506
" (wild animals)	234 "	120	1,570 (No.)	649
Tobacco	9,661 lb.	145	9,133 lb.	154
Tortoise shells	—	289	670 "	427
Wood (fire and other)	266 tons	743	226 tons	946
Wool	2,869 cwt.	10,061	2,082 cwt.	9,718
Raw sugar	111 "	115	—	—
Manufactured goods	—	11,813	—	8,970
Unmanufactured goods	—	2,115	—	4,396

it was expected that in 1920 there would be a large exportable surplus. These calculations may have been upset by a famine in 1918 when maize had to be imported. Before the war Germany took large quantities, and the United Kingdom, Arabia, and Italian East Africa were buyers of large amounts.

During the war the export of copra has dwindled to a figure which is the lowest since 1906. Originally most of the copra was consigned to Marseilles, which during the war was only accessible by transshipment at Genoa and this involved the payment of a special import duty.

East African coffee began to be exported in 1909 and now obtains high prices in the British market to which most of it goes. The export trade has, however, suffered during the war as a result of retarded production and soaring freights.

The bulk of the wool export goes to the United Kingdom, and the amount and value of this commodity has steadily increased.

The export trade from British East Africa to Arabia in mangrove poles has diminished recently as regards quantity, but increased considerably in value.

The greatest quantity of mangrove bark in 1913-14 went to Germany; in 1915-16 the United States took most with the United Kingdom a close second.

There is said to be a great future for the export of soda. In 1914-15 a shipment of 5,000 tons, valued at £13,333, was made; but the war seriously interfered with the working of the deposits and an insignificant quantity was exported in 1915-16.

It is significant of the change in character of the export trade that the export of ivory, which up to 1905 was first in the list, in 1915-16 constituted only 2 per cent. of the total.

With the decline of rubber planting since 1915 in favour of the more profitable production of fibre and coconuts, the export of plantation rubber has fallen away appreciably and it is unlikely that British East Africa will compete, at any rate for some time, in the rubber market.

A commodity which only began to be exported during the war, but which is likely to figure largely in the export trade of the future, is flax. Recently, largely because of the elimination of Russia from the trade, there has been a great world scarcity, and it is estimated that production cannot overtake the demand for some time. The pre-war average price was £55 a ton; since the outbreak of war small quantities of thoroughly cleaned East African flax have fetched as high a price as £250 a ton with every indication of rising still higher. The most recent figures of East African export are not available but cannot as yet be large.

A recent development also is wattle, for which a future is prophesied, as there is said to be plenty of room in the world market for British East Africa's production. Export figures are not available.

RE-EXPORTS

The port of Mombasa in British East Africa is important as an entrepôt from which imported commodities are re-exported to the neighbouring territories of Zanzibar, Italian East Africa, and the Belgian Congo. This trade in 1913-14 was valued at £197,313, representing 9 per cent. of the total trade merchandize imported. In 1915-16, as a result of the closing of the German lake ports which before the war received large supplies, the proportion fell to 2 per cent. of the total. In the five years previous to the war there was a steady increase in the value of this trade in spite of the competition of German East African railways.

TRANSIT

As regards transit trade for the same destinations, there was in the statistical year previous to the war a slight falling off in value, in that year £202,723. Since the war the decline has been considerable. The bulk of this trade, as in the case of re-exports, enters the Protectorate via Mombasa and Kilindini, whence it is transported by the Uganda railway to Kisumu on Lake Victoria, and from there distributed by

steamer to German East African ports and by the Busoga railway steamer and motor to Lake Albert to be forwarded to the Belgian Congo.

A small amount passes through Kismayu to ports on the Juba river in Italian territory.

There is also a considerable trade outwards through Mombasa and Kilindini in the exports of the neighbouring countries. The values of this trade for the last three years under review are as follows :

	1915-16.	1914-15.	1913-14.
	£	£	£
Uganda	356,642	506,878	564,244
German East Africa	872	150,941	448,103
Belgian Congo	24,209	31,986	26,127
Sudan	182	187	778

The bulk of Uganda's export is cotton ; other produce exported is hides and skins, coffee, ivory, grain, and chillies. As can be seen by the figures, the value of produce originating in German East Africa and exported by way of British East Africa in the year previous to the outbreak of war was considerable. The amount £448,103 represented a 35 per cent. increase over the year preceding a satisfactory sign that the Dar-es-Salaam-Tanganyika railway had not then succeeded in capturing the carrying trade from the rich districts in German East Africa in the neighbourhood of Lake Victoria. Hides and skins, ground nuts, cotton, coffee, and ghee were the chief items in this trade. From the Congo, ivory, rubber, and sometimes bullion are the principal commodities carried.

LOCAL TRADE

The wants of the native population are at present the chief feature of British East Africa's local trade. Trading centres have been opened in the region of the native reserves, and these consist mainly of the *dukas*, or shops of Indian traders, who draw their supplies from the bazaars of the big towns. These small trading establishments act also as *dépôts* for the collection of native produce.

In 1916 it was stated that 40 of these centres had been

opened in Nyanza province. The Kavirondo natives of this province are more than other tribes diligent in their application to agriculture, and among them, more than is the case with natives elsewhere, there is a demand for imported commodities and a readiness to use the cash medium. The Nilotic Kavirondo exchange dried fish for the grain of their neighbours.

The Nandi and Lumbwa, as is the case with other pastoral tribes, are stated to be more conservative. Among the Masai, however, the most important of the pastoral peoples, there is a small but increasing demand for commodities such as flour, tobacco, sugar, honey, swords, cooking pots, knives, axes, blankets, cloth, and even umbrellas. Originally the chief trade with the Masai was in cattle, for which they gave sheep in exchange. They could rarely be induced to part with cattle, but the heavy demands on their herds due to the necessities of war may have served to break down this prejudice. A prominent part in the trade of bartering cattle for Masai sheep was taken by the Somalis. The Kikuyu also engage in this trade. Before the war, by agreement with the Masai, 24 trading centres were established within the reserve, but of these half have during the war been closed down.

The Kikuyu of Kenya Province live mainly by agriculture. As in the case of other tribes gaining a livelihood in this way, they have as a result of protection afforded by British rule against the raids of the Masai accumulated numbers of cattle. Before the war 16 trading centres had been established in the province by Indians and Goanese, and there was a demand for blankets, cloth, beads, salt, wire, ghee, and iron hoes. Fort Hall and Nyeri exported maize to Nairobi and Naivasha, while large quantities of tobacco and grain were taken to Baringo and bartered to the Suk and Turkana for sheep and goat skins. At Nyeri there was before the war a trade in live stock, chiefly sheep and goats, brought in by Somali and Swahili traders from the Rendili Turkana and Samburu districts, but this has more recently fallen off.

Among the Akamba in the Ukamba province trade in imported goods was before the war still in its infancy, though a demand existed for blankets, beads, brass, copper-wire, hoes, sugar, salt, flour, rice, and tea. In 1916 there were 22 trade centres in the province.

Local trade in the coast provinces is carried on by Indians and Swahilis. The Wapokomo on Tanaland export foodstuffs, chiefly maize ; the bulk of their trade is with the Somalis.

The exports from Jubaland are grain, hides, ghee, and cattle, and there is a small sale of native made cloth.

In the Northern Frontier District there is a growing trade in cattle and ponies. The Boran and other frontier tribes send cattle and goat skins to Wajheir and other Somali centres whence there is an export trade to Meru, Nyeri, and Nairobi. The main route from the Abyssinian frontier to the East African highlands now runs southward from Moyale via the Wajheir oasis, the Lorian, and up the Guaso Nyiro to Rumuruti. At Moyale on the frontier there is a steady business in coffee and *bun* or coffee berry, both of which commodities are imported for Somali consumption. The mediums of exchange in this region are the Maria Theresa dollar and a cloth known locally as *maraduf*.

MANUFACTURES

The manufactures of British East Africa are at present insignificant, and for some time to come the main energies of its population will be devoted to the exploitation of its agricultural resources. There are at Nairobi and other populous centres industrial activities which are the indispensable adjuncts to the life of a civilized community, such as railway and other engineering establishments, water and electric power stations, flour-mills, bakeries, laundries, and printing establishments. There are those also which are auxiliary to the various agricultural industries of the country (see Industries, p. 394). Among these are cotton ginning, copra drying, sisal decortication, saw milling, oil milling, and rubber cleaning and pressing. The manufacture of dairy produce is now being

experimented with, and for this industry, bacon-curing, tanning, and soap-making there are said to be possibilities in the future.

Such native industries as exist are carried on by natives belonging to regions not reached by the Indian trader with his stock of foreign-made goods. In Rabai the Wa-Giriana engage in chain-making. In Lamu a variety of articles comprising wire rope, sandals, mat bags, hardware and silverware, earthenware cooking pots are made. Dhow building and cloth printing are also carried on. In Jubaland cloth locally woven on hand looms has a small sale.

At Mombasa, Malindi, and Takaungu on the coast there are fishing industries mustering (in 1915-16) a total of 296 boats and canoes. On Lake Victoria there were in the same year one steam and four motor launches in addition to native craft engaged in fishing.

Throughout the Protectorate there are stone quarries worked by various public bodies and by private individuals. There are several mica mines.

BANKS

There are two banks with branches in British East Africa. The National Bank of India, the Government bankers, have branches at Mombasa, Nairobi, Nakuru, and Kisumu.

The Standard Bank of South Africa has branches at Mombasa, Nairobi, and Eldoret.

LABOUR

The expansion of agricultural and other enterprise in British East Africa has been accompanied by an increasing demand for unskilled labour. Except in the case of an undertaking such as the construction of the Uganda railway, which was carried through mainly by the labour of coolies brought from India, this demand has had to be met out of the supply afforded by the tribal reserves. Very soon, in 1907 and 1908 the demand began to exceed the supply of

labour in the market. At that time the Government which had previously undertaken the task of labour recruiting left it to individual enterprise. The shortage became so acute that in 1912, as a result of requests from local authorities and land holders, a commission to enquire into the matter began its sittings in 1912, and in August 1913 issued a report.

Though there are natives in the reserves in sufficient numbers to meet the demand, there are various reasons why an inadequate supply is forthcoming. The large quantity of stock owned by pastoral peoples, and the natural fertility of the land in the case of agricultural tribes, make it unnecessary for any East African native to have recourse to employment outside. The pastoral races are by temperament disinclined to undertake manual labour, while the agriculturalists lost the last stimulus to strenuous effort when the menace of the slave raider and the Masai was removed on the establishment of British rule. In order, therefore, to incorporate the native in the rapidly extending industrial system of the European community in British East Africa, some new motive to effort has to be supplied.

Such incentives as exist at present are the desire to accumulate stock and wives, the necessity of obtaining the wherewithal to pay taxes, and, especially in the case of the Kavirondo, the desire to purchase European commodities. The expressed wish also of a Government official has great weight with the chiefs and their followers. The operation of these incentives has, however, been impeded by the methods of some recruiting agents, the insufficient or unsuitable feeding, uncomfortable transport, insanitary housing, and in a few cases ill-treatment of natives who have gone out to work. Moreover, the attitude of the local authorities has varied from place to place, the natives in some cases being left with the impression that the Government was indifferent or even opposed to natives leaving the reserves. In this connexion it will be easily understood that an administration with a limited staff finds it easier to control natives inside their reserves.

The two tribes which supply, under normal conditions, the

bulk of the labour, are the Kikuyu, including the Embu and Meru, and the Kavirondo. The Akamba were originally in the market, but as a result of their increasing wealth and higher intelligence, they have not of late sought employment as labourers. The Kikuyu supply labour in the greatest quantity, but though intelligent they are said not to be so capable, physically, or so trustworthy as the Kavirondo. Strict supervision is said to be necessary. The Kavirondo who belong to the warm moist region round Lake Victoria, are not suitable for employment in the highlands. These natives can be taught ploughing and working with waggons and oxen. Tribes like the Masai, whose wealth consists mainly of stock, consider themselves above manual labour, and except for a few who take service as herdsmen, they do not leave their reserves. Possible sources of supply for the future which have been mentioned are the Giriama and the Akamba.

In considering the question of supply a majority of the Commission of 1912-13 were opposed to the introduction, except in the last resort, and with stringent safeguards, of indentured Asiatic labour. A minority, however, advocated the importation of indentured foreign labour for the large public works and plantations of the coast lands. By this means it was expected that a considerable supply of local labour could be liberated for work elsewhere. With regard to the problem of making available more labour from local sources, it was agreed that changes in the economic situation of the tribes should be gradually introduced, such as the restriction of reserves to an area sufficient to support the present population only, and the gradual substitution of individual for communal tenure. The practice of squatting, i. e. the acceptance of natives as tenants on farms provided there is a *bona fide* agreement, which, while allowing to native to do what he likes with his own produce, stipulates that labour shall be rendered to the farmer, was with certain conditions recommended by the Commission. An ordinance regulating the practice has been recently framed.

The closer administration of the natives was deemed to be necessary, and the appointment of a special authority and staff to deal exclusively with native affairs was advocated. Owing to shortage of staff during the war no thorough-going change in the administration has been made. A native commissioner has been appointed, but he has no authority over the provisional commissioners and acts only in an advisory capacity.

A comprehensive system of identification was also recommended.

It was recognized further that the local authorities should make it clear that it was the Government's desire that the native should go out and work. Labour camps under Government control for the concentration of labour preparatory to recruitment were recommended ; the practice of recruitment by professional agents was condemned. The function of the Government, however, was restricted throughout to the regulation of labour.

While the war has interfered with the institution of any new policy, it has involved the compulsory service of natives in the Carrier Corps and in various military units. The immediate effect of this will be that on demobilization and repatriation the natives will be prosperous enough to avoid having recourse to employment outside the reserves, and the labour shortage may temporarily be acute.

Although some natives, notably Kavirondo and Akamba, are said to have some aptitude for machinery, skilled labour in the Protectorate is supplied mainly by Asiatics, chiefly Indians, who are the artisans of the country. Goanese are employed in the subordinate clerical posts.

The recruitment of labour and the relations between employers and labourers are at present governed by the Masters and Servants Ordinance, 1910. Under the ordinance magistrates possess powers of arbitrating in matters relating to contracts, and, where necessary, of inflicting fines or imprisonment for breaches of contract.

The table following is an official wage table issued in 1916 :

Field labourers :

Farm	.	.	.	.	.	8s. per month.
Coast	.	.	.	.	.	13s. 4d. per month.
Best field labourers	.	.	.	.	.	£1 per month.

Domestics :

House boys.	.	.	.	.	.	16s. to £1 13s. 4d. per month.
Ayahs	.	.	.	.	.	£1 to £2 per month.
Native cooks	.	.	.	.	.	£1 13s. 4d. to £2 6s. 8d. per month.
Goan cooks.	.	.	.	.	.	£2 10s. to £4 per month.
Indian	.	.	.	.	.	£2 10s. to £4 per month.
Carpenters	.	.	.	.	.	3s. 8d. per day.
Masons .	.	.	.	.	.	3s. 4d. per day.

The rate of wages is higher on the plantations in the coast territories than on farms in the highlands.

CHAPTER XIII

GOVERNMENT AND ADMINISTRATION

Home Government—Local Central Government—Provincial Government—Administrative Divisions—Justice—Révenue and Expenditure—Military and Police—Land Tenure—Currency, weights and measures.

HOME GOVERNMENT

THE supreme authority in the government of British East Africa is His Majesty, who appoints all the principal administrative and judicial officers and to whom is reserved the supreme function of legislation by means of Orders in Council exercised by virtue of treaty, grant, usage, sufferance, and other lawful means, as specified in the Foreign Jurisdiction Act of 1890.

LOCAL CENTRAL GOVERNMENT

The governor is His Majesty's representative in the Protectorate. He governs the Protectorate in accordance with Orders in Council and instructions of His Majesty under the Sign Manual or through the Secretary of State. Subject to the approval of the Secretary of State the governor can legislate in the form of ordinances; this approval is not necessary for secondary legislation under an order in council or an Ordinance. His Majesty's rights over Crown Lands are vested in the governor.

The governor is assisted by an executive council and a legislative council.

The Executive Council consists at present of five members who are all officials. They are the governor, the chief secretary, the treasurer, the attorney general, and the general manager of the Uganda railway. The governor in council means the governor with the advice of the Executive Council.

The Legislative Council has been described as a 'non-sovereign law-making body'. It consists of 20 members of which 8 are unofficial. The councillors are appointed by His Majesty and hold office during pleasure. In 1917 a commission reported in favour of the election of the unofficial members on the basis of a British suffrage.¹ The report is now under consideration. Subject to His Majesty's instructions the council has power to establish ordinances, courts, and generally make provision for the peace, order, and good government of the Protectorate. The governor has the power of vetoing such resolutions.

The various administrative activities of the Government of the Protectorate are co-ordinated by the secretariat under the chief secretary.

The other departments are : the Treasury, Customs, Port and Marine, Audit, Judicial, Attorney General's Department, Registry of Documents, Recorder of Titles Department, Police, Prisons, Medical (East Africa and Uganda), Education, Transport, Military, Posts and Telegraphs, Uganda Railway, Land, Surveys, Agriculture, Veterinary, Forestry, Game, Public Works, Registry of Slaves.

PROVINCIAL GOVERNMENT

For the purposes of local administration the Protectorate is divided into provinces which are subdivided into districts. (For list of administrative divisions, see p. 581).

At the head of each province is a provincial commissioner who administers the affairs of the inhabitants, European, Asiatic, and native, on behalf of the governor to whom he is responsible. Below him are the district commissioners and assistant district commissioners, who between them carry out the administration of the districts. The functions of these officials are comprehensive and vary from place to place according to the character of the population. The local repre-

¹ In 1919 an Ordinance was passed establishing eleven electoral areas, with one member each. The suffrage basis consists of British subjects of European origin or descent.

sentatives of the various departments, as the medical and police officers, co-operate with the local administrative authorities.

One of their most important functions is that of administering the native peoples which are located within the native reserves; the latter are closed to non-native occupation. It is possible that in time this will be their sole occupation, and that their other duties will devolve on the officials who are responsible to the various departments.

It is the policy of the administration to foster self-government among the native peoples, some of whom are organized in very small communities. To this end headmen, superior headmen, and councils of elders have been recognized as having authority to maintain order and provide for the upkeep of local public works. These native authorities are subject to penalties for neglect or insubordination. In the coast territories leased from the Sultan of Zanzibar the arab local authorities, *liwalis* and *cadis*, still persist.

The problems of government in townships are dealt with in several places through municipal committees composed of the local administrative authorities, and local departmental officials, such as the Medical Officer, and the leading residents appointed by the Government. This institution is most fully developed in Nairobi, where the municipal committee now consists of nine Government servants, seven European residents, and one non-European. The European non-official members are now elected. The chairman of the committee is the provincial commissioner or his deputy. The committee is empowered to prepare estimates of expenditure and to frame and submit to the governor rules for the health and general good government of the township. These, if approved, are issued by the Governor under the Townships Ordinance of 1903. The committee as yet does not possess the power of levying rates, although there is in existence an ordinance, the Municipal Corporations Ordinance, 1909, giving to municipal bodies wide powers, including the levying of rates. This so far has not been applied.

JUSTICE

The chief sources of law are the Civil Procedure, Criminal Procedure, and Penal Codes of India, and various British and Indian Acts specially applied. Justice is also administered in accordance with the substance of common law and doctrines of equity and statutes of general application in force in England. For local purposes these bodies of law may be modified by Orders in Council or an ordinance of the Protectorate Government. Mohammedan law in certain civil matters is administered by the Mohammedan courts in the coast territories. Native customary law in so far as it is not repugnant to justice or humanity is allowed in native courts, and in British courts in cases involving natives regard is had to local native custom.

The principal local court is the High Court which has full jurisdiction, civil and criminal, over all persons and all matters. Besides its original jurisdictions it possesses powers of confirmation, revision, and appeal in regard to the decisions of subordinate courts. The judges of this court who are appointed by His Majesty hold sessions at Mombasa and Nairobi. Trials of Europeans are with juries or assessors. Appeal is to the Court of Appeal of East Africa.

There are three classes of subordinate British Courts, namely, First, Second, and Third Class Courts. The Provisional Commissioner presides over Courts of the First Class, the District Commissioner over Second Class Courts, and the Assistant District Commissioner over Third Class Courts. These three officials are for the purpose of the administration of justice in criminal cases magistrates of the First, Second, and Third Class respectively. The jurisdiction of a Provincial Commissioner extends over a province, and the other two belong to a district. In populous centres like Mombasa and Nairobi there are specially appointed Town magistrates.

The powers of the British Courts are specially graded according as the particular cases involve natives and non-

natives. Appeal is to the High Court. The British Courts exercise supervision over the native tribunals.

In the coast territories there are the courts of the Liwalis, Cadis, and Mudirs. The Cadis' jurisdiction in civil matters is concerned with cases involving the personal status, marriage, inheritance, and divorce of Mohammedans. Appeal from the courts of the Liwalis and Mudirs is to the High Court, and from the Cadis Court to the High Court with the Chief Cadi or Sheikh ul-Islam as assessor.

Summary jurisdiction is exercised by magistrates of the First Class at their discretion in all cases, with certain specified exceptions.

Native councils of Elders, recognized by the Governor, have been given judicial powers to a limited extent over the communities where their authority is sanctioned by native custom. Their civil jurisdiction extends to cases involving a limited sum, and to claims arising out of marriage and inheritance. In criminal matters they can deal with offences against native custom and can inflict punishments which are not repugnant to humanity. Offences against the State, murder, dacoity with murder, enslaving a person, and dealing in slaves are excluded from their jurisdiction. Appeal is to a superior council if native custom directs, or to the District Commissioner. The Provincial Commissioner can re-try a case or revise a decision without re-trial. Fines are paid over to the administration.

REVENUE AND EXPENDITURE

Revenue in British East Africa is raised by taxation direct and indirect, public services, and the sale and lease of Crown lands. The direct taxation consists of a Hut Tax for natives, which in 1916¹ was levied at a maximum rate of Rs. 3 per annum for every hut, and Rs. 3 for every additional wife; a Poll Tax for natives not paying the Hut Tax, at a maximum rate of Rs. 3 *per annum*. These taxes in 1916 were leviable in the provinces of Seyidie, Ukamba, Naivasha, and Tanaland,

¹ In certain localities the rate has since been increased for both taxes from Rs. 3 to Rs. 5.

in the districts of Fort Hall, Nyeri, Embu, and Kenya, and in the townships and trading centres excluded from closed districts or native reserves.

For non-natives there is a Poll Tax of Rs. 15 levied on every male over the age of eighteen. Allowance is made in the case of small incomes, which at the discretion of the District Commissioner can be accommodated with a reduced rate.

The largest item in the category of indirect taxation is customs. There is an import duty of Rs. 5 on distilled liquors, eau de Cologne, and lavender water, and of 10 *per cent. ad valorem* on all other goods not specially exempted. Among the exempted commodities are personal luggage, goods for the governments of Uganda and East Africa, horses and mules, livestock for breeding purposes, ships and vessels imported entire, railway and general transport material, coal, gold, bullion, agricultural and industrial machinery, printed matter, telegraphic material, motors, and petrol.

There are also export duties as follows :

Ivory	15 per cent. <i>ad valorem</i> .
Gum copal	6 " "
Wild rubber	4 " "
Borities	} 10 " "
Hides and skins (trade)	
Rhino horn and Hippo teeth	
Chillies	
Ebony	} 5 " "
Cowrie and other sea-shells	
Horses	Rs. 21 each.
Camels	Rs. 4 "
Donkeys	Rs. 2 "

33 *per cent.* of the proceeds of customs duties is paid over to the Uganda Administration, which furnishes the same percentage of the cost.

Other items of indirect taxation are royalties on timber, man-grove forest produce, and mica, and various licences and fees.

The chief public services are the Uganda Railway and posts and telegraphs.

Ordinary current expenditure is regulated on the ' half and half ' principle ; i. e. the annual increase in expenditure is restricted to half the amount of the estimated increase in

revenue. An Appropriation Ordinance is passed each year to authorize the annual expenditure.

The following is a statement of revenue and expenditure for the last ten years :

	<i>Revenue.</i>	<i>Expenditure.</i>
	£	£
1906-7	461,363	616,889
1907-8	474,760	691,677
1908-9	485,668	703,103
1909-10	503,039	669,404
1910-11	609,585	682,041
1911-12	729,078	772,354
1913-14	1,123,798	1,115,899
1914-15	984,756	1,151,730
¹ 1915-16	1,165,561	1,072,916

Up to and including the financial year of 1912-13 a grant had been received from the Imperial Treasury ; in that year it took the form of a special grant considerably less an amount than the usual sum. The total thus received since 1895 amounts to £2,843,383.

For heavy capital expenditure resort has been to loans from Imperial funds. A considerable grant was made for the original expenditure on the Uganda Railway. Since this large sums have been borrowed for railway development and the construction of general public works. £250,000 was authorized in 1911, £375,000 in 1912, and in 1915 a further loan of £1,868,000 was sanctioned. The principal and interest in the first two cases is to be charged against the general revenue of the Protectorate, while interest in the third case is for the first three years chargeable against the loan and then against public revenue.

The contribution of the Protectorate towards the cost of the War has been estimated at £387,224.

MILITARY AND POLICE

Before the war there was a police force of over 1,500 of all ranks, the bulk of whom were African natives, with a few Europeans and Asiatics. The African ranks were composed

¹ The figures in 1918-19 were: Revenue £1,548,703; Expenditure, £1,570,705.

mainly of Kavirondo, Akamba, Swahilis, Somalis, and Wanyamwezi.

The military forces consisted of one battalion and two additional companies of the King's African Rifles.

LAND TENURE

Land tenures in British East Africa fall roughly into three main classes, namely, titles existing by virtue of native custom, those originally held under the law of the Zanzibar Sultanate, and those derived from the Protectorate Government.

In the first category comes all land in the Native Reserves which, subject to the will of the Protectorate Government, is held according to tribal custom. In practice the land is divided among the various tribes, clans, or families, and held in common. Land belonging to pastoral communities is divided into winter and summer grazing. Outside the reserves land actually in the occupation of natives is deemed to be excluded from leases to non-natives.

Tenure in the coastal strip leased by the Sultan of Zanzibar is based on Mohammedan law and includes the *wakf* lands devoted to religious and charitable purposes. Tenure in this region is at present vague, and the Government is engaged on the work of settlement. The Government claims ownership of waste lands and the title of private landowners is subject to the Government's right to acquire land for public purposes.

The earlier grants from Crown lands to private persons and companies were in freehold, but except in the case of homestead farms, this practice has been discontinued and leasehold is now the rule. The original type was for a term of 99 years with occupation and improvement conditions. Leases with revisable rentals based upon the unimproved value were subsequently introduced, and afterwards leases a subject to an occupation licence for the first three years during which the title was not negotiable. In 1915 the term of leasehold was extended to 999 years; the occupation licence was abolished, but the revised rental retained.

Freehold grants of land in Nairobi ceased in 1905 and the

general rule of tenure in townships is now leasehold for a term not exceeding 99 years. The lease carries building conditions. Temporary occupation licences are also obtainable.

The total area of the Protectorate, 157,000,000 acres, was in 1917 classified as follows :

Native Reserve	20,000,000 acres
Forest Reserve	2,000,000 „
¹ Land alienated	5,000,000 „
Unalienated land	130,000,000 „

EDUCATION

Provision is made in the colony for the education of children of Europeans, Asiatics, and natives.

The education of European children is largely in the hands of the State, whose representative, the Director of Education, is assisted by a board composed of officials and parents.

The apex of the miniature state system is the 'A' school at Nairobi, where boys and girls between the ages of 8 and 14 are accepted as boarders and day pupils. Although a part of the cost is borne by the Government fees are paid. Education is continued to the seventh standard, and the senior pupils are entered for the First Class College of Preceptors and the Cambridge Senior Local Examinations. The curriculum, however, extends beyond these limits and includes hygiene, elementary science, and geography. In 1913-14 the scholars on the roll numbered 150, of whom 50 were boarders.

A school, which accommodates boarders as well as day pupils, was opened at Eldoret in 1915. To some extent this school is recruited from three farm schools in the Uasin Gishu District which receive Government support. In these schools the Dutch language is in use, and Dutch pupils, on reaching the fourth standard, can transfer to the Eldoret Central School.

There is a small Government school at Nakuru, where education is continued to the fourth standard.

There are in the colony, besides, one or two private schools, where European children are educated, and the French Mission at Nairobi receives Eurasians and Goans.

¹ Since these figures were compiled 2,000,000 acres have been reserved for ex-service men.

The Y.M.C.A. and Y.W.C.A. provide continuation classes for young men and women respectively, with a view to their qualifying for posts in commercial life and under the Government.

The Government has made a start in the task of providing educational facilities for the large Indian community of the Colony, and there are two schools in existence, one at Nairobi and the other at Mombasa. Difficulties have been encountered with regard to the quality of the teaching staff and the nature of the curriculum. These are being slowly solved. The students at Nairobi are said to be less keen than those at Mombasa, where demonstration classes for pupil teachers have been started.

The Arab community on the coast has requested the Government to take charge of Arab education from the Koran stage upwards, and there is a Government school for Arabs at Mombasa.

The burden of native education has been for many years and still is supported by the missions, at whose various centres is provided an elementary literary education and, in several places, an industrial training. The mission schools in the colony in 1916 numbered a little over one hundred.¹ The Government have in recent years made capitation grants to the missions in respect of those industrial apprentices who pass the examinations set by the Department of Public Works. The Government itself, a few years ago, opened an industrial school at Machakos, with a view to the training of natives of the Akamba tribe. A problem not yet solved is the question of a satisfactory education for the sons of native chiefs.

CURRENCY, WEIGHTS AND MEASURES

Currency

The English sovereign is legal tender at the official rate of Rs. 15s. per sovereign. The silver currency is as follows :

Rupee of British India	} Unlimited tender.
Rupee of late I.B.E.A.	

¹ For list of Missions see Appendix C.

$\frac{1}{2}$ rupee of British India	} Legal tender to amounts of Rs. 5s.
$\frac{1}{2}$ rupee of late I.B.E.A.	
$\frac{1}{4}$ rupee of British India	
$\frac{1}{4}$ rupee of late I.B.E.A.	
50 cent piece	
25 cent piece	

The nickel, bronze, metal, or mixed metal currency is as follows :

10 cent piece	} Legal tender to units of $\frac{1}{2}$ rupee.
5 cent piece	
1 cent piece	
$\frac{1}{2}$ cent piece	

Both the Government and the general public keep their accounts in rupees and cents.

Weights and Measures

The weights and measures are the same as those in use in Great Britain, but the following are also used in dealings with the natives.

The *frasila* for ivory is the equivalent of 35 lb. ; for other goods, of 36 lb.

The *gisla* is used for grains and varies with the different classes of grain as follows :

180 lb., 285 lb., or 360 lb.

The *pishi* or *keila* measure is equal to the displacement of $6\frac{1}{2}$ lb. of fresh water.

The *Kibaba* is equal to 26 oz. of fresh water.

The *agoma* which is equal to $7\frac{1}{2}$ *pishi* is used in Tanaland only.

CHAPTER XIV

HISTORY

Early History.—The eastern coast of Africa was known to the Arabs and Persians from early times, but it is impossible to assign any definite date to the beginning of their intercourse. Their numbers were not sufficient to dispute the interior with the hordes of savages who dwelt there, and their settlements consisted of fortified towns on river-estuaries or on islands just off the mainland, where their maritime power secured them from attack. Such places are the islands of Patta, Manda, Lamu, and Mombasa, within the present limits of the British East Africa Protectorate, of Zanzibar and Pemba, which form a separate protectorate, of Kilwa in Tanganyika Territory, and of Mozambique in the Portuguese territory

The rise of Mohammedanism gave a great impulse to Arabian expansion and aggrandizement. The internal dissensions which followed the death of Mohammed contributed to form East African coast kingdoms, for defeated chiefs and their followers, in many cases, migrated to ports on the coast, already well known, and there founded small principalities. In the time of the Omeyyad caliphs there was also at one period a large force of black troops drawn from East Africa in their service at Baghdad. Until the coming of the Portuguese the coast towns remained under Arab rule, but their power came from their command of the sea, and did not extend far inland.

The Portuguese.—When Vasco da Gama reached the coast in 1498, after rounding the Cape of Good Hope, he found the coast towns, which were all under Arab rule, far more flourishing than they have been until quite recent times. But, although the Portuguese from 1500 sent annual expeditions to eastern waters, their attention was principally directed to India and

China. They achieved the control of the Indian Ocean by 1509 and the Arab power was overshadowed, though it did not entirely disappear. After 1507 the Portuguese made Mozambique their chief African centre and extended their authority intermittently over most of the Arab coast towns. Mombasa, though subjugated, was very disaffected, and was more than once destroyed in consequence. Malindi, on the other hand, was generally faithful to its European allegiance. Portuguese ascendancy began to decline after the annexation of Portugal to Spain in 1580. Their supremacy at sea, however, enabled them sooner or later to deal successfully with local revolts, and their authority was only finally displaced by that of another external power, the Arabs of the Oman, the south-eastern province of Arabia.

The Arabs of Oman and the Mazrui.—The Arabian district of Oman with its chief port of Muskat became subject to the Portuguese in 1508. They retained the maritime part of the district until 1633, when the Imam Nasur, ruling the interior, dispossessed them of all but Muskat. About 1652 a successor took Muskat from them and, having created a strong navy, proceeded to assail them both in Africa and India. In 1698 the imam captured the Portuguese fort at Mombasa and afterwards exercised suzerainty over Zanzibar and Kilwa and drove the Portuguese from practically all their East African possessions except Mozambique. By the beginning of the eighteenth century the towns of the eastern coast had voluntarily placed themselves under the protection of the Imam of Oman, or, as he is sometimes styled, the Sultan of Muskat. But the authority of the imams, exercised from Arabia and dependent on sea communications, proved intermittent and precarious. The real rulers of the eastern coast for a great part of the eighteenth century were the Mazrui, an Arab clan which had migrated from Oman to Mombasa, either at the end of the seventeenth century or much earlier (for there are two stories of their advent), before the coming of the Portuguese. In 1739, at the close of a troubled period of civil war during which the Portuguese had regained some

of their possessions, a Mazrui chief was put in charge of the Mombasa fort, and his descendants ruled the coast as representatives of the Imam of Oman until 1750. At that time a change of dynasty occurred in Oman, the Yorabi sultans were succeeded by the Albusaidi. The Mazrui refused to acknowledge the new dynasty and led a revolt of the east coast Arabs against Oman. The movement was successful, and the head of the Mazrui family ruled Mombasa as an independent sultan. But the Mazrui could not permanently control the other Arab coast towns and settlements, and, although only Zanzibar remained subject to Oman, the way was open for the imam to reconquer the former African dependencies piecemeal. This attempt was first seriously made by Seyyid Said, the fourth Albusaidi imam, who commenced his reign in 1804, and it was successful. He began about 1811 by assisting local parties and factions antagonistic to the Mazrui, and employed his superior naval power very effectively. After regaining the outlying dependencies he finally succeeded, in 1837, in expelling the Mazrui from Mombasa itself. In order to carry out his plans more securely he made the town of Zanzibar his capital between 1832 and 1840, visiting Muskat only occasionally. His reign lasted until 1856 and marks the beginning of the importance of Zanzibar as a trade centre, as well as politically. But his work was not completed at the time of his death. The Lamu Archipelago still retained some of its independence, and was not completely subdued until 1866 when the towns of Patta and Siu submitted.

The Beginning of English Influence.—The East India Company concluded treaties with the ruler of Oman in 1798 and 1800, but it was during Said's reign that English influence began to be important, and its growth was assisted by the aid afforded him by the Indian Government in establishing his authority in Oman and in repressing piracy. In 1811 the Mazrui at Mombasa, alarmed by his intervention at Lamu, sent a deputation to Bombay to secure the goodwill of the Indian Government. In 1823, when threatened with blockade by Said's naval forces, they hoisted the British flag without

authority, and in 1824 induced a British naval officer, Captain W. F. N. Owen, to establish a protectorate, subject to the confirmation of the British Government. But Seyyid Said had sufficient influence with the Foreign Office to prevent the ratification of the treaty, and in 1826 the English flag ceased to fly at Mombasa.

Before the death of Said in 1856 the local trade had largely passed into the hands of British Indian subjects, and the prestige of the English Government was so great at Zanzibar that, when a dispute arose with regard to the succession, it was submitted for arbitration to Lord Canning, the Governor-General of India. His award, which was given in 1861, was based largely on a letter addressed by Said in 1844 to the Earl of Aberdeen in which he had expressed his wishes with regard to the succession. The award severed the political connexion between Zanzibar and Oman. Zanzibar and the other African dominions were conferred on one son, Seyyid Majid, Oman on another. Canning also directed that Zanzibar should pay to Oman an annual sum of forty thousand crowns, equal to about £8,500, not as a tribute or sign of political dependence, but as compensation for the loss which the separation occasioned to Muskat. At a later time, when the subsidy excited discontent at Zanzibar, the Indian Government undertook to defray it.

Exploration.—Hitherto little interest had been taken by Europeans in the interior of Eastern Africa, except from motives of geographical curiosity, but before Said's death its economic possibilities began to be comprehended. The earliest detailed accounts of the interior came from Arab and Swahili traders who dealt largely in slaves. Towards the middle of the nineteenth century European missionaries began to explore. In May 1848 Johannes Rebmann discovered Mount Kilimanjaro, and in December 1849 his colleague, Ludwig Krapf, discovered Mount Kenya. To the missionaries succeeded geographical investigators. In 1858 John Hanning Speke and Richard Burton reached Lake Tanganyika while searching for the sources of the Nile. In August Speke dis-

covered Lake Victoria Nyanza and claimed that the lake was the true source of the Nile ; this belief was confirmed by Speke and Grant in 1863, and by Stanley in 1875. But these expeditions, though starting from the east coast, did not cross what became later British East Africa. They left the coast opposite Zanzibar and proceeded eastwards through what was afterwards German territory to the southern shore of Victoria Nyanza. There was, however, a much shorter route, sometimes used by Arab traders, leading directly from Mombasa to the eastern shore of the lake. It presented two difficulties. Whereas what is known as ' the German road ' traverses inhabited country throughout, the more direct route crosses desolate belts and passes through the land of the Masai, then the most formidable tribe of East Africa, a warlike race of pastoral nomads, who wandered over the grazing plains of the volcanic belt and the Great Rift valley. The first Europeans to show that this route could be used was Dr. G. A. Fischer, the German naturalist, in 1882, and Joseph Thomson, the Scottish geologist, in 1883. Their explorations were followed by others farther to the north. In 1887 Teleki von Szek and von Höhnel penetrated into what was afterwards the northern part of the Protectorate, discovered the last of the great African lakes, and named it Lake Rudolf.

Creation of English and German spheres of influence.—Before the task of discovery was ended the work of development was taken in hand. The opening of the Suez Canal in 1869 stimulated English interest in East Africa, and in 1872 the British India Steam Navigation Company established a regular service between Aden and Zanzibar. This enterprise was carried out by the Chairman of the Company, William Mackinnon, and was so much appreciated by the sultan, Seyyid Bargash, who succeeded Seyyid Majid in 1870, that in 1877 he offered to grant Mackinnon a concession under lease for seventy years of the customs and administration of the whole of the dominions of Zanzibar, including all rights of sovereignty with certain reservations with respect to the islands of Zanzibar and Pemba. Although the authority of the sultan did not

extend very far inland, this grant would have secured for the English the continuous coastline from Tungi south of Cape Delgado as far as at least Kipini, besides the important coast-towns north of Kipini as far as Warsheik. The littoral offered included the whole of that of the district which afterwards became German East Africa and thus German action in East Africa would have been anticipated. The Foreign Office, however, declined to give Mackinnon the support which he deemed necessary, and therefore he refused to take up the concession.

Some years later German enterprise, stimulated by Bismarck's more favourable attitude towards colonial projects, began to consider the possibilities of development in East Africa as well as in other parts of the continent. Bismarck, while no longer adverse to German projects of colonization, wished to avoid any action which might disturb his friendly relations with England, and as the English Government desired German support with regard to Egypt, there was no danger of serious misunderstanding. In 1884 the Gesellschaft für deutsche Kolonisation was founded, and in November its president, Dr. Karl Peters, and two companions arrived at Zanzibar disguised as mechanics. They crossed to the mainland and concluded treaties with the native chiefs of Mbuzini and the Usagara country, which secured some sixty thousand square miles for the Gesellschaft. In February 1885 Peters obtained for his concessions an Imperial Charter of Protection (Schutzbrief). A protest by Seyyid Bargash in 1885, in which he claimed control of large districts in the interior, led to an agreement on the part of England, France, and Germany to define the limits of the Sultan of Zanzibar's territory by an international commission. In June 1886 the Commission gave its decision, which in brief restricted the sultan's territory to the coast and islands. It was followed in October by an agreement between England and Germany, to which France and the sultan adhered in December, declaring his possessions on the mainland to consist of a continuous strip of coast-territory ten miles in depth extending from the south bank of the Minen-

gani, a river a short distance south of the Rovuma, to Kipini near the mouth of the Tana, together with the ports of Kis-mayu, Brava, Merka, Mogdishu, and Warsheik on the Somali coast, and the islands of Lamu and Mafia. The agreement then defined the German and British spheres of influence in East Africa. The British sphere was bounded on the north by the Tana. On the south it was bounded by a line passing direct from the mouth of the Umba to Lake Jipe, skirting the northern base of Kilimanjaro and running thence to the eastern shore of Victoria Nyanza at latitude 1° south. The agreement in effect defined the spheres of both countries as far as Victoria Nyanza, but it provided no definite western limit for either, and it made no arrangement with regard to the country north of the Tana.

The Imperial British East Africa Company.—The conclusion of this agreement stimulated English enterprise. The British East African Association was formed under the presidency of Mackinnon, and in May 1887 and October 1888 it obtained concessions for fifty years, afterwards confirmed in perpetuity, from Seyyid Bargash of his ten-mile strip of territory between the Umba and the town of Kipini. On September 3, 1888, the Association was constituted the Imperial British East Africa Company and was granted a royal charter. By this charter it was authorized to retain the concessions which it had already obtained by treaty with the Sultan of Zanzibar and with native chiefs and tribes within the British sphere of influence, and to obtain further concessions in Africa by treaty subject to the approval of one of the secretaries of state.

The territories of the Company consisted in the first place of the coast strip and ports leased to it by the Sultan of Zanzibar and, in addition, of a much larger area behind obtained by treaties with native chiefs within the British sphere of influence, made both before and after the grant of the Company's charter. The Company also extended its knowledge of the country by sending expeditions to survey and to report on its commercial and agricultural resources. In fact, the foundation of British East Africa is due to the Company, and more particularly to

its chairman, Sir William Mackinnon. It brought under English rule not only the fertile and tropical coastal plains and the belt of the nyika with its thorny jungle and bare turfless soil, but also the broad lava plains which lie beyond the nyika on both sides of the Great Rift valley, and abound in grass and timber. Beyond the Mau-Kamasia plateau the Company also first introduced English rule in the basin of the Victoria Nyanza and over the headwaters of the Nile, districts which lie partly outside the limits of the present province of British East Africa. In endeavouring to extend so widely the authority of the Company Mackinnon and his colleagues, though their action was hastened by German rivalry, were largely influenced by humanitarian motives, by the desire to suppress slave-raiding and trading, and to improve the condition of the natives. With these aims they prohibited the drink-traffic, started industrial missions, constructed roads, and administered justice.

German Competition. Witu.—In April 1888 Seyyid Bargash made a concession of his territory south of the mouth of the Umba to the German East Africa Company (Deutsch-Ostafrikanische Gesellschaft) in terms generally resembling those granted to the British East Africa Company in the preceding year. A period of friction followed this beginning of the German colony. Although the southern boundary of the British sphere of influence had been determined by the Anglo-German agreement the British Company had to contend with German rivalry both in the interior and to the north of the Tana. The questions relating to the interior belong mainly to the history of Uganda, but those relating to the districts north of the Tana must be noticed. Although these districts were situated beyond the boundary of the British sphere of influence as defined in the Anglo-German agreement of 1886, the Company by its charter was free to obtain concessions in other parts of Africa, subject to the approval of a Secretary of State, while the Anglo-German agreement of 1886 contained no provision which prevented them doing so except within the German sphere of influence.

The Germans had already gained a footing beyond the Tana in the town and district of Witu. This town was situated about twenty-five miles inland to the north of the river Ozi. By the Anglo-German agreement the coastline of the district commenced north of Kipini and terminated at the northern extremity of Manda Bay. The founder of the sultanate was a refugee from the power of the Sultan of Zanzibar. About 1860 Ahmed bin Fumo Luti, the last of the old Nabahan sultans of Patta, generally known as Simba (the Lion), was driven thence by the forces of Zanzibar. After some stay at Kipini and Kau, whence he was expelled in turn, he established himself at Witu at the head of a colony of refugees which was further reinforced by runaway slaves. Seyyid Bargash made more than one attempt to destroy this settlement, which lived largely by plunder and caused constant disquiet in the district, and in 1885 he was on the point of sending a fresh expedition for the purpose, when the German Government raised objections and informed the English Foreign Secretary, Earl Granville, that in 1867 Simba had requested the Prussian Government, through the traveller Richard Brenner, to grant him protection. In 1885 there were, in fact, Germans settled at Witu, and between 1885 and 1887 one of them, Clemens Denhardt, concluded four treaties with Simba in which the latter styled himself Sultan of Swahililand. These treaties granted large cessions of territory extending as far north as 1° south latitude, and comprising districts over which Simba had no authority as Sultan of Witu. The Germans seem, however, to have regarded him, on account of his former position at Patta, as representative, between the Tana and the Juba, of continental opposition to the re-establishment of the rule of the Albusaidi, and to have considered that he might justly claim authority over the districts whence Seyyid Bargash had driven him. In April 1887 Denhardt made an agreement with the Sultan by which he was granted the farm of the revenues of Witu for ten years, and in July he was appointed the Sultan's minister for home and foreign affairs for a period of fifteen years.

In 1887 a German company was formed, with a capital of £25,000, to develop the trade of the country. For this purpose it was desirable to obtain the island port of Lamu, as the Witu coastline contained no suitable harbour. In January 1889 the German Consul-General at Zanzibar demanded from Seyyid Khalifa, who had succeeded Seyyid Bargash in March 1888, the cession of the port and island of Lamu. But the Sultan of Zanzibar was naturally adverse to a measure intended to benefit Witu. Moreover, Seyyid Bargash, when he leased his continental territory between the Rovuma and Kipini to the British East Africa Company, had promised to grant, when necessary, a supplementary concession of the remainder of his dominions north of Kipini. Seyyid Khalifa therefore refused the request of the German Consul-General, and offered Mackinnon a lease of Lamu and the adjacent islands. On the remonstrance of the German Government, who alleged that both Seyyid Bargash and Seyyid Khalifa had verbally promised to cede Lamu to the Witu Company, the question was submitted to arbitration and the arbitrator, Baron Lambermont, Foreign Minister to the King of the Belgians, decided in August 1889 that the Sultan had the right to cede the islands to whom he chose. Seyyid Khalifa immediately granted a concession for five years, of the whole of his territories north of the Tana, to the British East Africa Company, which, however, in turn transferred Brava, Merka, Mogdishu, and Warsheik to the Italian Government in March 1891. The completion of the cession was delayed by the Germans, who, finding themselves excluded from Lamu, made objections to the transfer, and declared a protectorate over other parts of the coast. The question was finally settled by the Anglo-German agreement of 1890 (to be noticed immediately) which handed Witu over to England. In March 1891 the British East Africa Company took over the administration of the district.

Karl Peters's Expedition to Uganda.—Before the conclusion of the agreement of 1890, however, the Germans made a great effort to anticipate the British Company in the interior by

means of an expedition under Karl Peters. The project was only sanctioned by the German Government after considerable hesitation. The ostensible object of the expedition was to communicate with Emin Pasha in the Sudan, but in reality it was intended to establish a claim on the hinterland by means of treaties with native chiefs. Peters was precluded from starting from the German Protectorate by the revolt of the natives against the German administration. In consequence of this revolt a blockade of the East African coast had been proclaimed by England and Germany. Peters, however, landed near Witu in spite of the efforts of the English blockading squadron to prevent him and proceeded up the left bank of the Tana. His principal achievements belong to the history of Uganda, but he concluded several treaties with chiefs on the middle and upper Tana, and removed the Company's flag from several places on the ground that they were situated beyond the sphere of British influence, which he regarded as a field of action beyond which the Company could not pass.

The Anglo-German Agreement of 1890.—But Peters's efforts to extend German influence were rendered fruitless by the conclusion of the Anglo-German agreement of July 1, 1890, which defined English and German relations in Africa generally. By this treaty, in return for the cession of Heligoland, Germany renounced all claims to territory north of the Tana, agreed to the extension of the English sphere of influence, westward to the boundary of the Congo Free State, and northward to the Juba and also recognized an English protectorate over the Sultan of Zanzibar and his insular possessions, excluding, however, the continental strip of territory within the German sphere of influence and the island of Mafia, which were purchased outright by Germany at the close of 1890.

Difficulties of the East Africa Company.—Although the Anglo-German agreement relieved the English company from the fear of German aggression, other difficulties of a financial character arose which eventually proved insurmountable. They were due to some extent to the inevitable delay before

the development of the country afforded an adequate return for the capital expenditure. They were due still more to the insufficient financial resources of the Company. The necessity of anticipating German annexations had led it to extend the sphere of its operations more rapidly than had been intended. The directors had not originally contemplated the immediate occupation of Uganda or of the country north of the Tana. When these responsibilities were undertaken it became clear that the capital of the Company was too small for the task of developing the vast extent of country open to its enterprise. Moreover the most productive districts lay in the interior, and there also were situated the highlands, which were alone suitable for European colonization. There was great difficulty in providing means of communication with the interior and in obtaining sufficient labour for the plantations in the coast districts. There was a prospect of heavy expenditure which could only become remunerative after a considerable period. It is true that substantial assistance from government would have enabled the Company to undertake operations on an adequate scale. After British East Africa became a protectorate such aid was given to the local administration. A considerable annual grant from the Treasury was made until 1913 which enabled revenue to balance expenditure. Assistance of this kind was also given by the German Imperial Government to the German East Africa Company. But it would have been impossible for the English Government to adopt such a course without encountering strong opposition in parliament and raising many difficult questions with regard to the exclusive rights of the Company within its territory and its exercise of administrative authority. An effort was made to obtain state assistance in one particular instance. The Company proposed to construct a railway from Mombasa to Lake Victoria Nyanza, with the assistance of a loan from the Treasury of £1,250,000 at three per cent. There were particular reasons for assisting this enterprise because it would check slave-trading. But the prospect of opposition caused Government to draw back and the only

help ultimately given by the state was the sum of £20,000 voted by parliament in March 1892 for a preliminary survey. It is in this case, however, not improbable that further assistance might have been rendered had the period of the Company's rule been prolonged.

So far from rendering assistance the British Government in 1892 made the position of the Company almost untenable by bringing the dominions of the Sultan of Zanzibar under the financial provisions of the Berlin and Brussels Acts. In February 1885 the General Act of the Berlin Conference had created a zone of territory in Africa extending, as regards the eastern coast, from 5° north latitude to the mouth of the Zambezi, within which trade was to be free from import or transit duties. Only export duties were permitted and these in consequence of the prohibition of transit duties could only be levied on products of the territory itself. The Brussels Act signed in July 1890 was the outcome of a general conference on the subject of the African slave-trade. It proposed a number of practical measures against slave-trading, and, in order to provide for the expense of these measures, it so far modified the free trade clauses of the Berlin Act as to permit states to impose a duty on imports not exceeding ten per cent. *ad valorem*, but at the same time, by re-enacting the prohibition against transit duties, it restricted this duty to imports destined for consumption within the territory.

The greater part of the territories of the Company were always subject to the financial provisions of the Berlin and Brussels Acts because they were held directly under the British Government which had acceded to these acts from the first. But the coast area leased from the Sultan of Zanzibar was not so held until 1892, and, so long as it was exempt, the Company was able to subject the whole of the trade with the interior to transit duties when it reached the coast. The exemption of this littoral from the financial restrictions of the Acts dated from before the time of the Company. The Sultan of Zanzibar in November 1886, when accepting the other provisions of the Berlin Act, refused to

adopt those relating to free trade. By his concession of October 1888 he made over his customs duties to the East Africa Company, which undertook in return to defray the costs of administration and to pay him a fixed annual sum. The customs, though based on several separate treaties with different powers, consisted in fact of an import duty of five per cent. *ad valorem* on all goods landed for the first time at any port in the sultan's dominions, except goods previously specified for transshipment to a foreign port, and of export duties, varying in amount, but determined by treaties, levied on articles leaving the territory.

In November 1890 the English Government declared a protectorate over the sultan's dominions, and in July 1892 it placed them, including those leased to the Company, under the trade regulations of the Berlin and Brussels Acts. This action swept away the existing import and transit duties. Under the provisions of the Brussels Act, however, the Government proposed to impose an import duty of five per cent. *ad valorem*, which would be collected by the Company within its territories. Though in appearance this duty was similar to that hitherto levied, it was in fact more limited in its incidence, for owing to the prohibition of transit duties it could only be levied on imports intended for consumption in the sultan's territory. As the sultan's continental territory consisted of a strip of coastland only ten miles wide a great part of the revenue had hitherto been derived from goods in transit. The duty on exports was similarly restricted to the products of the territory, while the products of the external districts conveyed through it no longer contributed to the revenue. The Company was thus deprived of a large part of the customs duties, from which it had hitherto defrayed the costs of administration and provided the annual payment to the sultan.

In addition the new import duty was authorized by the Brussels Act in order to provide for the cost of executing its provisions against slave-trading. It was, therefore, not fully available for the purposes of the Company. It is true

that among the measures proposed by the act were several that would be serviceable to the Company, because they would assist to develop the country. Such, for instance, were the construction of roads and the establishment of telegraphs. But, while recognizing this, it remains unquestionable that on the one hand the measures proposed by the Brussels Act involved additional expenditure and that on the other the proceeds of the new duty could hardly be legitimately employed for paying the Sultan of Zanzibar's subsidy or even for defraying the general cost of administration. The Company was therefore placed at a financial disadvantage by the action of the British Government.

Unfortunately it had no remedy. The changes were carried out in the name of the Sultan of Zanzibar. They were contrary to his concession to the Company, but as a foreign sovereign he was not amenable to the British courts. A recourse to diplomatic representations was equally precluded. Had the concession been made to subjects of a foreign power their government might have demanded an equitable settlement. But in this case the change was in reality the work of the British Government and, therefore, the Company could look for no support. The British Government probably felt itself obliged by its original accession to the Berlin and Brussels Acts to bring the dominions of the Sultan of Zanzibar completely under their regulations after establishing a protectorate. It was also undoubtedly desirous that goods from Uganda and other parts of the interior should not be subject to transit duties at the coast. Sir Gerald Portal has called attention to this possibility in his Report on Uganda. But if these considerations rendered a modification of the Company's concession unavoidable, it would seem that it was entitled to compensation for the consequent financial loss.

Withdrawal of the Company from Uganda and Witu.—Financial considerations gradually led the Company to narrow its sphere of action, which German rivalry had prematurely extended. This policy of withdrawal was originally resolved

on before the change in the customs duties in 1892, which has just been described, and must, therefore, not be regarded as a consequence. But it is probable that the change caused the withdrawal to become more complete. The Anglo-German agreement of July 1890 had secured for Great Britain the province of Uganda and its dependencies. But, although Captain F. D. Lugard succeeded in establishing the authority of the Company there, the directors found the financial strain too great, and in July 1891 they resolved to withdraw. After some delay the country was handed over to the Foreign Office on March 31, 1893. In the same year the Company also withdrew from Witu. The abandonment of the territory by the Germans in 1890 was followed by the massacre of a German party with the connivance of the sultan who was irritated by the withdrawal of German protection. This compelled the British Government to send a punitive expedition and to appoint another sultan. In March 1891 the protectorate was transferred to the Company, but commercially the country proved disappointing. The former ruler and his followers withdrew into the forests of the north and thence harassed the district. It was necessary, therefore, to keep a garrison of Indian troops in the capital. The climate was deadly and the trade dwindled into insignificance in consequence of the disturbed state of the surrounding country. In July 1893 the Company withdrew and the English Government constituted a separate protectorate of Witu and all the British sphere north of the Tana except the ports belonging to the Sultan of Zanzibar which the Company still retained.

Establishment of the British East Africa Protectorate.—The Company now began definitely to contemplate confining its activity chiefly to the coast lands and islands granted it by the concession of the Sultan of Zanzibar. At the close of 1893 it held only two stations outside these limits. These were Dagoreti, a little west of the present capital Nairobi, and Machakos south-eastwards and rather nearer the coast. In every direction its prospects had become dubious. Planta-

tions on the coast had been worked at a loss owing to the renunciation of slave labour, and expectations of trade had not been fulfilled. In March 1894 Sir Gerald Portal's report on Uganda was presented to Parliament. While acknowledging the valuable pioneer work accomplished by the officers of the Company in the way of exploration and economic investigation in the interior, he pointed out that the Company by its withdrawal had left the problem of development unsolved, and that it would be exceedingly difficult to solve it if the interior and the coast-lands were administered on different principles and under distinct authorities. He held that the experiment of combining administration and trade in the same hands had proved a failure, and he recommended that the political functions of the Company should be transferred to commissioners with a sufficient force and staff at their disposal to secure their political ascendancy and the safety of Europeans resident in the country. The death of Sir William Mackinnon in June 1893 may have made the directors of the Company less unwilling to accept Portal's conclusions. In May 1894 it was resolved to negotiate with Government for the surrender of the charter and in March 1895 to relinquish the charter and the Zanzibar concession, together with their property in East Africa, for a sum of £250,000, the amount of the Company's original capital. The final transfer took place at Mombasa on July 1, 1895, and the territory was placed under the Foreign Office and styled the East Africa Protectorate. This protectorate, in which was merged the protectorate already constituted of the territory north of the Tana, included all British East Africa territory except the Uganda Protectorate and the islands of Zanzibar and Pemba, but the Uganda Protectorate, when the common boundary came to be defined, extended farther eastwards than now—to the western limits of Kenya and Laikipia.

The Revolt of the Mazrui.—The new Government was immediately called upon to deal with an Arab revolt. For some time there had been serious dissatisfaction among the

Arabs, and in 1894 the Germans at Tanga had been asked whether they would assist an outbreak. Among the more general causes of discontent were the anti-slavery policy with which all Englishmen in the country were identified, the prohibition by the Government of the sale of slaves, the protection afforded to native tribes, and the attacks of the missionaries on Islam as a religious system, accompanied by some success in making converts. Fortunately these general issues were not the direct grounds of the revolt, which was occasioned by a dispute as to the succession to a Mazrui chieftainship, a subject which tended to divide Arab feeling. When the Mazrui clan was expelled from Mombasa in 1837 they formed two settlements, at Gazi, a port about thirty miles south of Mombasa, and at Takaungu, a small town on the estuary of the Senawe, the same distance north of Mombasa. At Takaungu the Company had supported the candidate who was more friendly to the English, and his rival had raised a revolt. Both settlements became involved in the rebellion, which extended also to some of the Swahili tribes. The Giriama, however, the most powerful of the coast tribes, remained quiet; and by the end of April 1896 an Indian force under Colonel Pearson compelled the rebels to take refuge in German territory, where they surrendered and were placed, by Major von Wissmann in the territory of Usarama. The migration of the Mazrui involved the loss of some of the most intelligent and prosperous inhabitants of the east coast, but, by breaking the power of the influential Arab potentates, it hastened the transformation of the coast territory from a protected Arab state into an English colonial government. Moreover, the exile of the Mazrui was not permanent. An amnesty was proclaimed at Mombasa and the greater part of the refugees eventually took advantage of it to return to British territory.

British East Africa as a Protectorate.—The history of British East Africa since it passed under the direct control of the English Government has been on the whole one of prosperity and continuous progress. It has not been marked by any

great crises. In the years immediately preceding the present war economic progress was very much accelerated and the country, which had hitherto been assisted by a considerable subsidy, became more than self-supporting. This was not unexpected; for the subsidy had rendered it possible to carry out considerable undertakings for developing the resources of the country, and for opening up roads and other means of communication.

After the establishment of the protectorate its boundaries were defined and its limits to some extent enlarged. The Anglo-German frontier was based on the agreement of July 1890. The part from the coast to Lake Jipe and around Kilimanjaro was surveyed and finally determined in 1893 and 1900. The survey of the frontier east and west of the Victoria Nyanza was completed and the boundary finally fixed in 1906. The boundary of Italian Somaliland was provisionally determined in 1891. The Abyssinian frontier was defined by an agreement with Menelek II signed in December 1907. In March 1902 the eastern province of the Uganda Protectorate was transferred to the East Africa Protectorate and formed the Kisumu province (now styled the Nyanza province) and the western part of the Naivasha province, and in July 1904 the waters and islands of the eastern part of Victoria Nyanza were placed within the protectorate. In 1908 foreign consular jurisdiction in the Zanzibar strip of coast was transferred to the British crown, and the whole protectorate is now virtually a British crown colony.

Government of the Protectorate.—Until 1905 the government was vested in a commissioner appointed by the Foreign Office, whose powers were defined by an order in council of August 1902. When the protectorate was proclaimed in 1895 Machakos was made the centre of administration, but in 1899 the head-quarters were removed to Nairobi, which was already the railway centre. On April 1, 1905 the protectorate was transferred from the Foreign to the Colonial Office, and by an order in council dated November 9, 1906, it was placed

under the control of a governor and commander-in-chief. An order in council of October 22, 1906, created an executive and a legislative council. The former consisted of four members, in addition to the governor, and the latter eventually of eight official and four unofficial members. The members of both councils were nominated by the crown and held office during pleasure. The executive council was an advisory body, but the legislative council was empowered to make ordinances subject to the vetoes of the governor and the crown. A concurrent right of making ordinances was reserved for the Privy Council.

The Uganda Railway.—The most notable achievement of the earlier years of the protectorate was the construction of what is known as the Uganda Railway. Though no part of the line lies within the Uganda Protectorate, its designation emphasizes the fact that the railway was undertaken largely for the commercial development of Uganda and the surrounding districts, and in order to secure for their products a practicable route through British territory. These considerations were strongly urged by Sir Gerald Portal in 1893 in his report on Uganda. It must also be borne in mind that the Naivasha district and Victoria Nyanza province, through which the western part of the railway runs, though now part of British East Africa, were still included in the Uganda Protectorate when the line was being constructed. The railway, as already mentioned, was originally projected by the British East Africa Company. The undertaking was urged for humanitarian as well as commercial reasons, and Lord Salisbury speaking at Glasgow in 1891 recommended it on the ground that by superseding caravan traffic it would render slave-trading impossible. When its construction was actually undertaken railway administration and finance were kept distinct from those of the Protectorate. The first rails were laid in 1895, the first train reached Victoria Nyanza in December 1901, and the railway was completed in 1903. In recent years several branch lines have been made, the most notable being that to Lake Magadi, which was taken over by

the Uganda Railway in August 1915. The railway begins at Mombasa, passes through Nairobi, and eventually reaches Lake Victoria Nyanza at Kisumu or Port Florence. It has become almost the sole route for the trade and commerce of Uganda and British East Africa, has attracted a considerable amount of traffic from German East Africa, from the Kilimanjaro districts and the regions round the south of Victoria Nyanza, and has opened the highlands of the interior to European settlers. In addition, running parallel to the southern frontier and a short distance from it, it has proved of great military value in the present war. It was taken over by the military authorities in November 1915.

The Abolition of Slavery.—The history of the measures taken against slavery is naturally closely connected with the history of the same subject in the Zanzibar Protectorate, where further details will be found. But there is this difference between Zanzibar and East Africa, that in a considerable part of British East Africa slavery was never an institution. There were, as a rule, no slaves among the native African tribes. Slavery was customary mainly in the coast districts where the Arabs and Swahilis reside. But the interior supplied slaves and the passage of slave caravans to the coast only ceased when the Uganda railway made progress.

In 1876 the Sultan of Zanzibar proclaimed the abolition of slavery in Kismayu and his possessions in the Benadir coast. This proclamation was, however, not enforced, and no steps were taken to carry it out at Kismayu until the British Government assumed the administration in 1895. Within the rest of the sultan's dominions in the mainland slavery was a fully-recognized institution. When the British East Africa Company obtained their charter it refused to recognize the status of slavery outside the limits of the Zanzibar concession. Within those limits it was a part of the social system, and the Company's managing director, George S. Mackenzie, found himself faced by a difficult situation at the beginning of his administration in January 1889. The station of the Church Missionary Society at Rabai, and other neighbouring mission

stations, harboured about fourteen hundred fugitive slaves, of whom two-thirds belonged to Arabs of the coast. The Arabs in resentment contemplated attacking the stations at Rabai and Freretown. Mackenzie, however, induced the Arabs to accept a compensation of twenty dollars for each slave, a compromise which they welcomed, and, to prevent the same situation arising again, required the missionaries to obtain 'permits of residence' for the slaves living at their stations. The amount of compensation paid was over £3,500, of which the missions and their friends contributed £2,200 and the Company over £1,300. The Company subsequently employed hired labourers on their plantations with a view to encourage the substitution of free for slave-labour in the coast districts, but the financial results were not at first very encouraging.

In 1890 two important steps were taken. Mackenzie induced the Arab community, through the Liwali of Mombasa, to recognize those tribes which had treaties with the Company, as free peoples. On the 1st of May he issued a proclamation placing these tribes under the protection of the Company and declaring their members incapable of being held as slaves. This proclamation protected the tribes at the back of the coastline for a distance of about three hundred miles into the interior. It materially restricted the field from which slaves could be drawn, and facilitated their release, if captured, without offending the coast Arabs. It failed, however, to include the people of Kikuyu, who were frequently enslaved. The second important measure in 1890 was taken by the Sultan of Zanzibar. In August he issued a proclamation concerning slavery which contained important restrictive provisions. It prohibited all traffic in slaves, who henceforth were only to pass from one owner to another by lawful inheritance. If an owner died without lawful descendants his slaves became free. This provision was from the time of publication rigidly enforced by the Company, and afterwards under the Protectorate, and a large number of manumissions were the result.

The prevalence of slavery on the coast was considerably lessened under the Company, but it was still recognized for

some time after the Protectorate was instituted. In 1898, at the instance of the Foreign Office, a further step was taken. In 1889 Sir Gerald Portal had concluded an agreement with Seyyid Khalifa, the Sultan of Zanzibar, that all children born in his dominions after January 1, 1890, should be free. This agreement had never been promulgated, but in October 1898 the Commissioner, Sir A. Hardinge, ordered it to be published in the mainland territory of the sultan, and directed that it should be enforced in the event of any cases coming before the courts. Finally, under the pressure of English opinion, the legal status of slavery was abolished rather suddenly on October 1, 1907, throughout the East Africa Protectorate. It was provided that compensation should be awarded to any owner lawfully possessed of a slave, provided application was made before the close of 1911. This change was effected without any disturbance, but for some years the Arab community suffered severely from the loss of slave labour. The free labour, which eventually was substituted, was drawn partly from the old slave class and partly obtained by recruiting labour, with the assistance of the Government, among the more industrious native tribes of the coast and interior. Government took advantage of the opportunity to impose conditions with regard to the treatment of the labourers.

Administration of Native Races.—In dealing with the native communities the general principle was observed of preserving tribal control by means of recognized headmen, and in some instances of paramount chiefs, who were responsible for acts committed within the limits of their area. In this way native customs and law were perpetuated and great power thrown into the hands of the headmen. The system was codified in 1902 by the Village Headmen Ordinance. Government authority and supervision is maintained by means of district commissioners, to whom every native has a right of appeal; and general native questions are entrusted to a commissioner for native affairs. The expense of administration is defrayed by means of a hut tax of three rupees, first instituted in 1901, and lately supplemented by a poll tax

on those who have no domicile. In those regions which are suitable for European settlement native reserves have been established in order to prevent their exclusion from the soil. These reserves give rise to difficult questions. They include large tracts of valuable and fruitful land which remain almost undeveloped under native cultivation and which naturally become objects of desire to European settlers as the land conveniently situated for occupation becomes exhausted.

Government control was only gradually extended over the tribes within the Protectorate. Its establishment was frequently marked by temporary disturbances due to the survival of earlier modes of seeking redress, but in almost every case these were transient and were succeeded by tranquillity consequent on the recognition of the benefits of orderly rule. On the cessation of raiding and fighting the natives took to bringing their cases in large numbers to the civil and criminal courts. In *Guy Mannering* Scott remarks a similar phenomenon among the Scottish lowlanders. The most persistent difficulties were with the Somali of Jubaland, a nomadic and pastoral people of superior intelligence, with a great aptitude for trade. They were due to the late establishment of administrative control and to intercourse with the warlike tribes of the interior of British Somaliland across the territory of the Italian protectorate. The chief tribal divisions in Jubaland are the Herti and Ogadein. The former dwell near the coast and at Kismayu. They are more or less settled and have been loyal to the Government. The Ogadein are wilder and more nomadic. In 1898 some fighting took place with them on account of their persistence in raiding the fertile littoral of Tanaland as well as the more inland regions inhabited by the Galla, who were the dominant race north of the Tana until many years ago they succumbed to the Somali. In November 1900 they murdered A. C. W. Jenner, the sub-commissioner of Jubaland. War was declared against them; but it was found impossible to capture or bring to action light-footed nomads, and proceedings terminated with the imposition of a heavy fine on the Sultan of Afmadu and the military occupation of

Yonte. The Ogadein Somali were gradually tamed by stopping their trade and depriving them of luxuries which they value, such as cloth and coffee. Finally, in 1913, Jubaland was brought under administrative control at the same time as the Northern Frontier district. They were the last parts of the Protectorate to be fully organized.

Tribes in other districts proved easier to deal with. The Ulu district was reduced to order by 1897, and the people of Kikuyu between 1895 and 1898. The Masai, in spite of their renown as warriors, gave comparatively little trouble, though they massacred a Swahili caravan at Kedong in 1895 and carried out two large raids in 1898. In the last quarter of the nineteenth century they suffered disasters which permanently weakened them, such as famine, repeated attacks of cattle plagues, notably in 1884 and 1890-1, and small-pox. In 1904 they were placed in two reserves—one on the Laikipia plateau and the other to the south of Nairobi. Between June 1912 and April 1913 Sir Percy Girouard removed them all to the southern reserve in order to make the northern available for European settlement.

In 1905 the Nandi people, dwelling not far from the eastern shores of Victoria Nyanza, gave considerable trouble. Among lesser irregularities they replenished their store of arms by dismantling the railway and appropriated the telegraph wires as ornaments for their women. An expedition was sent against them and in November they sued for peace and were placed in a reserve. In 1905 a small punitive expedition was sent against the Sotik, a tribe dwelling in the Nyanza province to the west of the Mau highlands; in 1906 against the Embu, a subdivision of the Akikuyu; and in 1907 against the Kisii, situated south of the Gulf of Kavirondo. In the last ten years there has seldom been a necessity for armed coercion. In 1910 and 1916 expeditions had to be dispatched to the territory of the Turkana tribe in the Naivasha province, and in 1914-15 there was a rising of the Giriama near the coast.

The European Colonists.—The advent of European settlers on a considerable scale only began in 1903. By that time the

disposal of land was completely under Government control. The sale of land to non-natives without permission was forbidden in 1897. In 1902 the Crown Lands Ordinance declared all unoccupied land the property of the Crown. The assignment of land was therefore a function of the Government. The colonists came mainly from Great Britain and South Africa, which supplied both British South Africans and Afrianders of British sympathies. Settlers also emigrated from Australia and the United States of America. From the early days of the settlement a certain amount of friction arose between the colonists and the Government. At first the administration was not adequately equipped for allocating land suitable for settlement, and vexatious delays occurred. At a later time more serious differences arose with regard to terms of land tenure and relations with the natives. In the early days of the settlement a good deal of land was in freehold. Afterwards the Government from time to time made changes in its land regulations, but, when Lord Elgin was Foreign Secretary, it adopted the general plan of granting land on lease with a tenure not exceeding 99 years, and periodic re-assessments of rent. This did not satisfy the colonists, for the periodic re-assessments of rent made it difficult to obtain loans from the banks, and they desired freehold tenure. In 1914 a compromise was attempted, agricultural land being granted on a lease of 999 years, but as Government reserved the right to re-assess the rent every 33 years, the change failed to satisfy the landholders. The relative treatment of land trusts and private settlers added another element of discord and a difference of opinion on this subject with Lord Lansdowne, the Foreign Secretary, led to the resignation of the Governor, Sir Charles Eliot, in 1905. The colonists were also strongly impressed with the feeling that the Government, and particularly the Commissioner for Native Affairs, showed undue favour to the native races. This feeling was due, in part, to the large areas occupied by native reserves and partly also to the redress afforded by the courts to natives treated with violence by Europeans, but it was due also to the difficulty of

obtaining native labour. The colonists desired that some system of compulsory labour should be instituted and that the conditions imposed by Government with regard to labour should be relaxed. In 1906 an ordinance was issued which enacted that contracts for more than one month must be in writing, and that, if either party was unable to read, they must be concluded before a magistrate. In 1908 the colonists pressed the Government to obtain a supply of indentured labourers from India. Government declared its willingness to do this if it proved necessary, and also to recruit labour in the Protectorate if certain regulations concerning the housing, feeding, and treatment of labourers were observed. In 1910 contracts were limited to a period of 2 years. In March 1908 a representative meeting of colonists on the labour question at Nairobi led to a demonstration in which the Governor, Sir James Sadler, was called on, in a tumultuous fashion, to resign his position. For taking part in the proceedings two of the unofficial members of the Legislative Council, Lord Delamere and Mr. Baillie, were suspended from office.

Although the suspended members were afterwards reinstated this incident strengthened a wish, which already existed among the colonists, to be represented by elected members. Since the constitution of the Council in 1906 they had been represented by unofficial members who were nominated by the Government. When Government, after several instances, refused to grant their request for elected members, the unofficial members of the Council, with the exception of the representative of the coast districts, resigned in 1913. The nucleus of an informal representative system had already been formed about 1908 by the Colonists' Association of Nairobi. The committee of this body met regularly and dealt with subjects presented to it by country settlers and planters. Under the auspices of the Association a local association was formed in each district, and at a later time the Colonists' Association was replaced by a more elaborate representative central body composed of a certain number of members from each district association and entitled the

Convention of Delegates. An Association of Landowners was formed at the same time to protect the interests of those holding land from the Crown. Since the beginning of the present war the admission of elected members to the Legislative Council has been recommended by the Governor, Sir H. Conway Belfield, and approved in principle by the Colonial Office. Since this the unofficial members have resumed their seats, and in June 1917 a committee of the Legislative Council presented a report dealing with the details of the scheme.

PART II

KENYA PROTECTORATE

THE PROTECTORATE OF ZANZIBAR

CHAPTER I

GENERAL DESCRIPTION

Area—Population—Zanzibar Town and Harbour—Government
and Administration

THE Archipelago of Zanzibar is a chain of islands running parallel with the coast of what was German East Africa. The two chief islands, Zanzibar and Pemba, with their attendant smaller islands, form the Zanzibar Protectorate under British rule, while the smallest and southernmost of the three large islands, Mafia, has of late years formed part of German East Africa. Geographically considered, these islands are outposts of the African coast, and show by the rocks of which they are composed that they were once part of the continental coastal zone.

The islands of Zanzibar and Pemba lie between south latitudes $4^{\circ}47'$ and $6^{\circ}29'$, off the coast of German East Africa, where the coast-line from Ras Pongwe, north-east of the mouth of the Rio Umba, to Ras Dege, south of Dar es-Salaam, forms an extensive and shallow bay. They command the mouths of all the rivers within this bay and the important ports of Tanga and of Dar es-Salaam, together with Bagamoyo, the trading settlement 40 miles to the north of Dar es-Salaam.

The two islands forming the British Protectorate are separated from the African coast by channels named respectively after them. Zanzibar Channel forms a curve about 95 miles long, with a mean breadth of 20 miles (least breadth,

16½ miles). The opposite shores of this channel are in general parallel to each other. It is studded on either side with coral reefs, which in one place restrict the navigable fairway to a breadth of less than 3½ miles. The least depths in the channel are 14–15 fathoms. Its deep northern prolongation opens direct on to the Indian Ocean and separates Zanzibar from Pemba Island.

Pemba lies about 22 miles to north-east of Zanzibar, and is almost due east off the mainland port of Tanga. The navigable portion of Pemba Channel is contracted by reefs on the west side to a width of 26 miles at the southern and 19 miles at the northern entrance, there being deep water between these reefs and the island.

Zanzibar is an old-established centre of trade and government, a position which it owes to its geographical situation. It has the security of an island combined with the commercial advantage of proximity to the mainland; its harbour is admirably sheltered and well adapted to the needs of coast-wise traffic; and its own fertility has done much to increase its wealth.

Pemba on the other hand is situated on no natural trade route; and its climate, owing to excessive rainfall, has always told against the settlement and development of the island. Its remoteness from trade and civilization, combined with the intricacy of the labyrinth of channels that fringe its western side, arrested the suppression of the slave trade longer here than elsewhere in the Zanzibar Archipelago; and the same causes make Pemba to this day a refuge for fugitives from all parts of the east coast.

AREA

The total area of the islands of Zanzibar and Pemba is 1,020 square miles, Zanzibar having an area of 640, Pemba one of 380 square miles. Zanzibar has an irregular oblong shape running roughly in a SSE.–NNW. direction. Its greatest length, namely from Ras Nungwe to Ras Kisimkazi, is some 53½ miles; its greatest breadth, which is from Chukwani on

the west coast to the root of the Michamwi peninsula on the east coast, is 23 miles. Pemba is 40 miles long, with an average breadth of 10 miles (greatest breadth, about lat. 5°S., 13 miles). The numerous small islands that fringe the western or inner side of the two main islands are, with the exception of Tumbatu to the north-west and of Uzi to the south-west of Zanzibar, of little extent, and the economic value of their surface area is almost negligible.

POPULATION

The population of the Protectorate, according to the census taken in 1910, was 197,199.

The population of the island of Zanzibar was 114,069, of whom 43,416 were adult males, 49,230 adult females, and 21,423 children; that of Pemba, 83,130, of whom 28,480 were adult males, 31,899 adult females, and 22,751 children.

The population of the town of Zanzibar was 35,262.

The density of population is estimated at 175 per square mile in Zanzibar and 219 in Pemba.

The birth-rate (births registered) for the year 1917 was 21·0, as against 19·08 per 1,000 in 1916.

Measures are being taken to ensure more accurate registration of births; it is believed that the births equal or even exceed the deaths, contrary to opinions based on the figures now available.

The Arabs were the conquerors and are the principal land-owners of the islands. The conditions of life in a malarious and tropical country have deprived them of much of the vigour which distinguished their ancestors; and the stoppage of the supply of slaves has left many of them almost without resources. Nevertheless they still possess most of the land, and carry on the clove-growing industry for which the two islands are famous. They understand the natives, and the natives understand them and accept their control more readily than that of any other race, except Europeans.

The bulk of the population in Zanzibar consists of representatives of all the tribes of East Africa, intermingled with

an Asiatic element. The name given to this mixed population is Swahili (*sawahil*, plural of *sahil*, Arab. coast), a term formerly used to denote the coastal tribes from Somaliland to Mozambique.

The total negro population of Zanzibar is about 60,000, which includes natives of the Comoro Islands, who greatly resemble the Swahili and are much occupied in domestic service.

The descendants of the early settlers of the island of Zanzibar are called Wahadimu and live on the eastern portion of the island, especially on the east coast. They are the principal cattle-breeders of the island. Mhadimu means *servant*, a term bestowed by the northern tribes when they conquered the country.

The natives of Pemba are known as Wapemba ; they do not live in such seclusion as the Wahadimu on the larger island, but intermingle more freely with the Arabs and Swahili. In the north-west of Pemba are some fair people, possibly descendants of colonists from Shiraz.

Khojas, Bohoras, Hindus, Parsees, and Goanese possess most of the trade of Zanzibar, either as merchants, shop-keepers, money-lenders, small traders, or skilled mechanics. Goanese keep the European stores and provide both cooks and dhobis. They and the Parsees are also employed largely as clerks. Here, as everywhere in East Africa, the Indian is the middleman between Europeans and the natives. There are about 3,000 Mohammedan Indians living in Zanzibar and nearly 1,000 non-Mohammedan Indians.

A considerable contingent of natives of German East Africa and of the Comoro Islands settled in Zanzibar, and with the north-east monsoon arrive numbers of Somalis, Shihiri Arabs, and Baluchis in dhows laden with the products of their countries. These usually return with the south-west monsoon, but a few remain and settle permanently.

Mohammedanism being the chief religion, there are many small mosques about the main islands, and Pemba, in particular, is studded with them.

ZANZIBAR TOWN AND HARBOUR

Port Zanzibar, situated lat. $6^{\circ} 10' S.$, long. $38^{\circ} 15' E.$, to the south of a bay on the most westerly and central portion of the island of Zanzibar, is the capital alike of the island and of the Sultanate and Protectorate of Zanzibar; it is the largest and most populous city, and in native estimation the chief city, of the East African littoral.

The town of Zanzibar, in Swahili Unguja (pop. 35,262), lies on Shangani, a triangular rocky and sandy tongue of land about $1\frac{1}{2}$ mile long. About 1 mile north-eastward of Ras Shangani is the entrance to the shallow salt-water inlet or lagoon, Pwani Ndongo, that dries at low tide, but at high water nearly converts the town into an island, being to the south of it only separated from the sea by a low sand and coral ridge. The lagoon is here and there overgrown with mangroves. Mabindi Spit, fronting the entrance to the lagoon, extends half a mile from the main shore. The site of Zanzibar town and its lagoon affords a good example of atoll formation.

On the east shore of Pwani Ndongo, and connected with the town proper by a bridge over the lagoon, is the negro quarter, Ngambo (meaning 'Strand'). Behind this village runs from north to south a depression, probably a former lagoon, containing patches of swamp, now drained. Beyond the suburbs groves of coco-nut palms alternate with clove plantations.

The suburbs are malarious and unfit for European use; horses also cannot be kept there. The city, however, is fairly healthy.

The area of the town is about 400 acres.

The town has a good hotel, clubs, golf links, and tennis courts. The best house in the city is that of the British resident. There is an Anglican cathedral, a Roman Catholic church, and several mosques. Zanzibar is an important missionary centre, in connexion with which hospital and native schools are maintained. The leading bank is the National Bank of India. The most conspicuous building from the sea

front is the Government Offices, until 1912 the Sultan's Palace, an edifice of very poor design. The town is a crowded maze of narrow streets, built without plan or architectural character of any sort. The monotony of the heavy colour-washed walls is often relieved by fine Arab doorways of carved wood. The town is rendered interesting by the variety of races which crowd the main thoroughfares. There are some good shops, mostly kept by Indians. The bazaars, markets, and the native town are the most interesting features.

There is a light railway to Babuba, 7 miles. There are 75 miles of road throughout the island suitable for motor traffic.

Strategically Zanzibar harbour is not well protected. It has, however, commercially a good, well-protected anchorage, as ships lie close in, and weather very seldom interferes with transportation of cargo.

The harbour (see further, p. 527) is, however, devoid of piers and cranes suitable for transporting heavy material, and has no factories capable of undertaking large work. There is an iron pier, 483 ft. long, terminating in 9 ft. of water, as well as smaller piers. All landing is done by lighters.

The chief value of Zanzibar as a port is its function as a central station for the collection and overseas shipment of produce from the interior of the continent. On a coast like that of East Africa, which is on the whole open and harbourless, and also ill-supplied with inland lines of communication, such a station, where dhows from the various minor ports can transfer their cargo to ocean-going vessels, is an absolute necessity. The same purpose could, however, be served by Dar es-Salaam, or even by Tanga or Lindi; and the recent growth of these ports and of Mombasa (Kilindini) has robbed Zanzibar of much of its past importance. It is still, however, the centre of trade between the east coast on the one hand and Arabia and India on the other; it controls a great deal of local coastwise traffic; and as a coaling and cable station it is still of value.

There is cable communication direct with Bagamoyo; by

way of Aden or Durban with Europe ; and by Seychelles and Mauritius with Australasia and the Dutch Indies.

The British India Steam Navigation Company and the Union Castle Steamship Company maintain monthly services between London-Zanzibar-Durban and Southampton-Zanzibar-Durban respectively, the Clan-Ellerman-Harrison Line between Glasgow-Liverpool-Zanzibar-Beira (cargo only), and the Compagnie des Messageries Maritimes between Marseilles-Zanzibar-Madagascar. The British India Steam Navigation Company also maintain a service twice a month between Zanzibar-Mombasa-Aden and the Benadir Coast. The Government possesses two steamers which maintain regular weekly connexion with Pemba.

GOVERNMENT AND ADMINISTRATION

ZANZIBAR is a British Protectorate. The native ruler is the Sultan. A British High Commissioner and a British Resident, who are appointed under His Majesty's Sign Manual and Signet, exercise their functions under the Zanzibar Order in Council, 1914. The Sultan's decree countersigned by the British Resident is law. The Sultan is assisted in his legislative functions by the Protectorate Council, presided over by himself with the British Resident as Vice-President, and six others, three of whom are officials and the remainder unofficial members. The Council has no legislative authority, but assists only in a consultative and advisory capacity.

The central government is organized in departments of which the chief are the secretariat, the treasury, customs, port service and shipping, agriculture, judicial and legal, administrator-general's department, attorney-general's department, police and prisons, medical, health, education, public works, railway, and electricity, and King's African Rifles' department.

The controlling authorities of local government are British with Asiatics in the subordinate posts. The British officials consist of two District Commissioners, one each for Zanzibar

and Pemba, with several Assistant District Commissioners. Goanese and other Asiatics fill the lower administrative posts.

There are two bodies of law in the Protectorate administered by two sets of courts.

British subjects, foreigners and British protected persons, meaning those persons belonging to a British possession other than Zanzibar, are subject to a composite body of law consisting of various Indian statutes, the decrees of the Sultan, and, where these do not apply, to the common law and doctrines of equity and general application of England. This law is administered by His Britannic Majesty's Court, otherwise known as the Court for Zanzibar, and certain subordinate courts, for which legal provision was made in 1917, namely, the Magistrate's Court for Zanzibar and Pemba, the District Commissioner's Court in the Weti District of Pemba, the Assistant District Commissioner's Courts in the remaining districts of Zanzibar and Pemba, and the Kathi's Courts in such places as the chief judge may direct. Appeals from the Court of Zanzibar are to the Court of Appeal for East Africa.

Subjects of the Sultan are amenable to courts which are guided in both criminal and civil matters by the general principles of the law of Islam and native custom, where this is not repugnant to justice and morality. These courts comprise a supreme court for hearing appeals, and subordinate courts with defined jurisdictions, namely, the Court for Zanzibar and Pemba, District Courts, and Kathi's Courts. There are also town magistrates in Zanzibar and Pemba. Except for the Kathis the judicial personnel is British.

The chief source of revenue in the Protectorate is customs duties. Import duties (1916) are levied on all incoming commodities with specified exceptions, such as agricultural implements, fresh meat and dairy produce, and several others. Export duties at varying rates (1916) are imposed on chillies, cloves, hides, rubber, sim-sim, shells, and tobacco. Other sources are court fees, registration fees, the earnings of Government services and rents of Government property.

In 1917 the total revenue was £297,746, the highest yet

recorded, and the total expenditure £259,961. The public debt amounts to £100,000, issued to the British public in 3 per cent. debentures under the Loan Decree of 1899. This debt is being gradually extinguished by annual payments to a Sinking Fund, which at the end of 1917 amounted to £49,793.

The standard coin of the Protectorate is the silver rupee of India. All other silver coins of British India up to 5 rupees, and Seyidieh copper pice up to 1 rupee, at the rate of 64 pice to the rupee, are legal tender. Gold coins of the Royal Mint are legal tender to any amount at the rate of 15 rupees to the £1. There is a Government note issue in denominations of 5, 10, 20, 50, 100, and 500 rupees against which security is held in cash to the approximate proportion of 55 per cent. of the issue, and the remainder in Imperial and Colonial Government securities.

There is a branch of the National Bank of India in Zanzibar.

Owing to the confused condition of land tenures which comprise freeholds and lands dedicated to holy and other purposes in the plantation area, communal tenure in the villages of the original inhabitants and tenures elsewhere based on Mohammedan law, the Government in 1915 made legal provision for a Settlement Board.

CHAPTER II

PHYSICAL GEOGRAPHY, VEGETATION, AND FAUNA

Zanzibar Island—Tumbatu, Uzi, and Latham Islands—
Pemba Island—Vegetation—Fauna

ZANZIBAR ISLAND

Geology

ZANZIBAR is a coral island, but it is not exclusively composed of coral. On the contrary, the coral seems to have been formed round a nucleus of pre-existing limestone rock, still here and there visible at the surface. This rock, a limestone of Tertiary date, apparently formed at one time a barrier reef along this part of the east coast. After it was broken up into small fragments by the action of the sea, the deposition of coral began, and by this process a number of isolated rocks were cemented together to form the island of Zanzibar.

Subsequently a third type of formation was added, namely, a series of sedimentary calcareous deposits, coarse and sandy in character, of a type well known on the adjacent coast under the name of Mikindani beds. These three formations between them account for the whole geological character of Zanzibar.

The distribution of these rocks is fairly simple. The Tertiary limestone nowhere appears over a large area. It is found in the north of the island at Mkokotoni and in the adjacent islet of Tumbatu; again at Chokani, between Uzini and the eastern coast of the island; at Hatajwa hill south-west of Zanzibar town; and at Pete on the Uzi channel. The Mikindani grits are fairly frequent in the western part of the island; they are believed to have been more widespread in the past, but to have disappeared from the exposed eastern

slopes under the influence of erosion. At present they form a characteristic topography in the west. They appear to overlie the coral, which is therefore the subsoil of the island everywhere except, presumably, in the immediate neighbourhood of the Tertiary limestone outcrops. Over the greater, though not the more valuable, part of the island, the coral crops out at the surface.

There is unmistakable evidence that at no very distant period the present island of Zanzibar formed three distinct islets. The channels dividing these islets are still to be seen in the shape of two swampy depressions, one of which runs southward from Chwaka on the east coast to Pete on the Uzi channel, and cuts off the flat and almost uninhabited south-eastern lobe of the island from the mainland; while the other runs from Mwanda lagoon in the north, SSE. or parallel to the main axis of the island as far as Menai Bay, thus cutting off from the mainland a long and narrow strip of territory on which Zanzibar town itself is situated. This second depression contains the two chief rivers of Zanzibar, the Mwera flowing south and the Zingwe Zingwe flowing north; it may conveniently be referred to as the Mwera depression.

General Features

The island falls naturally into two physical divisions: a western region composed chiefly of Mikindani beds, and an eastern region composed of coral. The western region is the smaller of the two; it is accidented, fertile, and densely populated, containing as it does the capital, most of the chief villages, and the famous clove plantations. The large eastern region is a flat expanse of arid rock with stunted vegetation, little water, and hardly any inhabitants. These regions are described in detail below.

In general physical structure the island consists of ridges running north and south, or rather north by west-south by east. In the west these ridges take the form of definite undulations, whose extreme elevation above the sea-level reaches 443 ft. In the east the undulations die out, and the

only relief observable in the coralline region is a series of terraces (raised beaches) running in the same general direction.

Zanzibar contains nothing that can be called a river system, but it has several permanent streams. Of these the chief is the Mwera, rising in the Poko papyrus swamp and flowing southward along the bottom of the above-mentioned Mwera depression; the Zingwe Zingwe, rising in the same swamp and flowing northward, is almost as large. The permanent streams are, however, confined to the western region; those which flow eastward from this region vanish almost immediately on entering the coralline district, which, on account of its extremely porous character, has no permanent water at the surface. There is thus a tendency for all rivers in Zanzibar to disappear if they come into contact with the coral which almost everywhere underlies the Mikindani beds; and this is actually done by the Mwera itself, which disappears in a swamp not far from the capital. Conversely, the underground water in which the coralline region is rich may break out at the surface; and a large stream does so appear almost on the very sea-shore at Chwaka.

The western coast of Zanzibar is almost everywhere easy of approach, having deep water fairly close inshore, few outlying rocks except those which surround and protect the harbour, and in many places an easily accessible beach. The eastern shore, on the other hand, is protected to seaward by a continuous coral reef, dry at low water, which stretches parallel to the shore at a distance of about a mile from high-water mark.

The Western Region

This, the fertile portion of the island, consists of a belt some 8 or 9 miles broad, extending roughly from the centre line of the island to its western coast-line.

Physically this belt is composed of three ranges of hills all running parallel to the coast.

First, immediately behind Zanzibar town rises the Masingini ridge, so called from its highest point (443 ft.). This ridge occupies the whole of that strip which (as above mentioned)

the Mwera depression separates from the main body of the island. The ridge is more or less hog-backed, sinking to north and south from its highest point in the Masingini hills, and only broken in its regular profile by Hatajwa hill, a dome-shaped outcrop of the older limestone standing at the southern extremity of the ridge, and attaining a height of 207 ft.

East of this ridge lies the Mwera depression.

Secondly, and forming the western flank of the Mwera depression, comes a ridge which may perhaps be described as the Mwera ridge. This begins at Mkokotoni in the north, and soon attains a height of 330 ft. in Donge hill ; it is then broken through by the valley of the Mwana Kombo stream, but at once asserts itself again and proceeds southwards in the form of a narrow but quite distinct ridge to Kiwani, beyond which it can be traced in a line of rocks dividing Kiwani Bay from Kombeni Bay.

Third, and separated from the Mwera ridge by an arid and stony plain, is the Dunga ridge. This is a low and inconspicuous ridge, standing only about 125 ft. above sea-level at most ; it can be traced, however, from Uzini southward through Dunga to Kibele, a distance of about 12 miles. The whole of this ridge falls within the fertile region, but the coralline desert abuts immediately on its eastern slope.

Of the first ridge the whole extent north of Zanzibar town is fertile and well watered and covered with clove plantations and date groves. It is only in the extreme north that the ground is too damp and low for growing cloves. South of the latitude of Zanzibar town, towards Hatajwa hill, this ridge is less fertile ; cloves do not grow here, though the extreme south of the ridge is well planted with flourishing palm groves. The soil over this ridge as a whole is a red sandy loam, interrupted in the southern part by stony patches. North-east of Hatajwa hill is a barren rocky terrace containing two remarkable potholes of the type discussed below (see section on the eastern region) but of unusual size. This terrace is almost treeless and steppe-like in vegetation. The Masingini hills, the chief eminence on this ridge, have a steep drop to westward and

a gentle slope, covered with clove woods, to eastward, down which streams run to join the Mwera.

The Mwera depression, with the exception of its two extremities, is fertile and covered with clove plantations. The Mwera river is shallow and clear ; it flows among magnificent aquatic vegetation till, after attaining a width of about 6 ft., it suddenly disappears in the swamp of Kibondei Mzungu. The Zingwe Zingwe, which rises in the same papyrus swamp as the Mwera, is reduced in dry weather to a chain of pools ; in its lower course it is permanent. It reaches the sea in Mwanda lagoon.

The second ridge is almost entirely covered with clove plantations except at its southern extremity. The northern end of this ridge lies in the Mkokotoni district, a very fertile region containing numerous palm groves, second in importance only to the region inland from Zanzibar town. Mkokotoni hill, with its rocky and precipitous north face, is a striking exception to the rule that all the relief of Zanzibar Island is of a gentle and undulating character. The soil of Mkokotoni is clayey and sandy loam, which supports mango, banana, orange, and other fruit trees, and also a certain extent of marshy meadow.

South of Mkokotoni is an exceedingly fertile region, almost flat, intersected by sluggish and weedy streams, and supplied with a considerable variety of soils on which cloves, fruit trees, palm groves, and cereals flourish. In the eastern part of this region a good deal of rice is grown. South of this district again is a rich clove district stretching along the east side of the Mwera valley.

The third or Dunga ridge forms a separate area of clove plantations, isolated from the rest by the stony plain to west of it. The soil, here again, is red loam. The clove plantations extend from Uzini in the north to Tunguu in the south, beyond which the fertile country is prolonged by the Kibwele district to Pete.

Economically attached to the western district is the Chwaka depression, running from Pete across the island to the Indian

Ocean. This depression is filled with a perennially moist humus of great fertility, supporting an extremely rich vegetation. Alternative names for this natural feature are the Mapopwe or Jangwani depression.

The Eastern Region

The eastern region, comprising perhaps two-thirds of the total area, strongly contrasts with the region already described. It is fairly homogeneous in character. Composed of coral rock, it nowhere rises to any considerable height ; the maximum altitude is about 100 ft. It consists of a flat plain, entirely unbroken by watercourses or hills, almost bare of soil except where the irregularities of the rock have sheltered a little pocket of red loam, and riddled with potholes and caves. This type of Karst topography, overgrown with a dry and scanty scrub, holds good over the whole eastern or coralline district of Zanzibar. The potholes in most cases contain water, sometimes fresh, sometimes brackish ; here and there they are used as wells. The natives regard them as haunted, but use them when necessary as places of refuge.

The region falls into two parts, separated by the Chwaka depression. The southern portion is a mere desert, with a few villages along the sea-shore, possessing small patches and cultivation and palm groves. Close to the southern extremity is the curious oasis of Kufle, which lies entirely inside a large and shallow pothole. The northern part is traversed along its whole length by two parallel escarpments running north and south, both facing east. These are successive sea-beaches. The plateau above the uppermost escarpment is on the whole the least sterile part of the coralline region. Here occasional oases may be seen, where chillies, tobacco, and other crops are grown ; and the scrub here is of a less xerophilous character than in the southern area, where little grows except hard-leaved prickly plants.

The worst parts of the coralline region are those which are most exposed to the violence of the south-west monsoon. If shelter could be obtained by means of tree-belts, it would

be possible to obtain accumulations of surface soil which would almost certainly prove fertile, especially as underground water can be had in any quantity 60 or 70 ft. down.

Coasts

West coast.—It has already been remarked that the west coast of Zanzibar Island is for the most part open, easy of approach, steep-to, and largely sheltered. It is also densely overgrown with tropical vegetation, and in many places supplied with fresh water. It affords spacious and secure anchorage in the three inlets of Menai Bay, Zanzibar harbour, and Mkokotoni Bay.

Ras Kizimkazi, the southernmost point of Zanzibar Island, appearing from sea as a long low-wooded hill, is a rounded point with a small sandy bay at its south-west extremity. The fringing coral ledge dries off Ras Kizimkazi for a distance of nearly a mile, to a steep edge. The cliffs, though low, are undermined, and landing is impracticable.

From Ras Kizimkazi the coast, here composed alternately of low cliffs and sandy bays, trends NNW. past Kizimkazi village (former residence of sheikhs of Zanzibar; ancient buildings; good water) for 5 miles to Mchangamle (Mchanga), where the Uzi channel (Peete Inlet) is entered. A fertile range of hills about 100 ft. high runs parallel to the coast; rice fields, clove plantations, coco and areca palms, mango trees.

At Miungoni the mouth of the creek is reached, running north and following the course of the Chwaka depression. On this creek, situated upon an outcrop of Tertiary limestone, is Pete, a Wahadimu village with a very fertile hinterland in the Chwaka depression.

The whole Uzi channel is dry at low water except for a narrow channel up the centre. The depths in this channel are 3–5 fathoms, decreasing northward. After passing Pete the channel curves round west and south-west, to emerge at Ras Bwene into Menai Bay.

Menai Bay, the outer part of which lies between the outlying islands Pungume and Kwale and their reefs on the west,

and Uzi and Vundwe on the east, while the inner is formed by a deep indentation in the main island, is about 12 miles long with an average width of $3\frac{1}{2}$ miles. The east shore from Ras Bweni has low cliffs, sandy beaches, and a fringing coral ledge that in places dries to nearly a mile. The head of the bay is lost in the mangrove swamps of the Mwera depression, and is divided by the elongated Ukanga Island into the two smaller bays of Kiwani and Kombeni. Ukanga, which is partly cultivated, is connected with Zanzibar Island by a mangrove wood. The Kiwani-Kombeni Bay is a continuation of the Mwera depression.

Menai Bay affords good and sheltered anchorage off Unguja Mkun, and has a depth of at least 6 fathoms till about this point, north of which it begins to shoal.

Unguja Mkun, Swahili for 'Old Zanzibar', is by some thought to have been the chief port when the Portuguese occupied the island. But there are no vestiges of ruins. This fertile district has a mixed population of Arabs, Swahili, and Wahadimu, distributed in huts scattered about magnificent and continuous palm groves. To its north Unguja Mkun is separated by a small untilled tract of savanna from Bungi, which has very fine coco-nut groves and mango avenues, mostly owned by Arabs. At the north end of the shallow Kiwani Bay is Kiwani village, with numerous Swahili gardens and palm groves, situated at the south end of the Mwera depression. West of Kiwani are grassy, in part stony, plains (interrupted by small cultivated oases) by which the Hatajwa or Kombeni peninsula is reached.

Pungume Island, the west point of entrance to Menai Bay, and the first of the chain of small islands forming the east side of Zanzibar channel, is a coral island $1\frac{1}{2}$ mile long and over $\frac{1}{2}$ mile wide, on the south part of a coral reef $2\frac{1}{2}$ miles in length. It is waterless and stony, but not infertile, and it affords an occasional resort to fishermen and woodmen. Kwale, a low rocky island, nearly 3 miles NNW. of Pungume, is similar. Between Kwale and Ras Fumba is a narrow channel, 6 ft. deep, much used by small craft and boats working along the coast.

Kombeni peninsula, that forms the west side of the head of Menai Bay, is a flat well cultivated tract of land about 40 ft. high, with Ras Yeketekambe (or Makita, or Mkita) and Ras Fumba at its south-eastern and south-western extremities. A landmark is afforded by Hatajwa hill ($3\frac{1}{4}$ miles to the north of Ras Fumba), a conspicuous rounded mass of rock rising 200 ft. above the level plain. Its side and base are riddled with caves and passages, due to wave-erosion in the past. The coastal cliffs are also rich in caves.

From Ras Fumba the west coast of Kombeni peninsula trends northwards for $5\frac{1}{2}$ miles by Ras Mbuyu. It is low and faced by a coral reef some 3 cables in width. On a reef off the peninsula are three low rocky islets. Chombe Island, over $\frac{1}{2}$ mile long, with overhanging low cliffs, is covered with trees and dense bush and surrounded with coralline reefs. On its west side are a lighthouse and a landing-place (sand).

From Ras Mbuyu, where are high and extensive red cliffs, to Ras Shangani, on which stands Zanzibar town, a distance of about $5\frac{1}{2}$ miles, the coast is chiefly formed of low cliffs, with white sandy bays at intervals, the land behind tree-covered.

North of Ras Mbuyu, near Chukwani palace, are some fine springs which the natives hold to be the resuscitated Mwera river.

At Mbeweni Bay are bluffs and cliffs of moderate height, composed of green sand and red loamy clay, which the heavy rains erode into picturesque forms. Minute garnets are found in the sand of this bay. A thin seam of lignite crops out between high and low water marks, in a bed of blue clay at the foot of Kiungani bluff. Peat, too, occurs in isolated patches on this western coast.

The coast approaching Zanzibar city is lined with coco-nut palms, backing a narrow strand of sand. Except for a few slight eminences the land is alluvial and flat.

The site of the port, the houses of which by their dazzling whiteness are visible at sea many miles away, is marked by Ras Shangani, a low rounded promontory projecting but

slightly from the general line of coast. The extensive anchorage is well sheltered, being protected to the east by the island and on the west by the mainland, here 16 miles away.

The harbour, which is wholly natural, extends about 3 miles to the southward of Ras Shangani, and about 2 miles north-eastward of the same point, while its width abreast the point is about 2 miles, gradually narrowing to the southward and north-eastward. The depths are 6-11 fathoms in the southern portion, 8-13 fathoms abreast the town, and 7-10 fathoms in the north-east. Less than 2 cables distant from Ras Shangani are two patches, on a line with one another, with a minimum depth of 3 fathoms. The harbour is cool owing to the prevalence of a freshening breeze.

Zanzibar harbour is approached by six passes between the islands and reefs, viz. : from the south by the Inner and Southern Passes ; from the west by the Western Pass ; from the north by the Great Pass, the narrow French Pass, and the English Pass.

Of the southern approaches the Inner Pass, between some of the small islands and the coast, which is in part double, is about 9 miles in length by at least $\frac{1}{2}$ mile in width. It is navigated by eye, and is preferred by dhows in order to avoid the current. Through the Western Pass, which is due south of Cable Island, are laid several submarine telegraph cables. From the north the English Pass (between the coast and Grave Island) is the entrance generally used by vessels, the Great Pass, though the widest and deepest, having no leading marks and not being buoyed.

Off the northernmost half of the harbour are situated a number of low, waterless coralline islands. Nearest to the coast is the uninhabited Chapwani (Grave Island), on which is a disused naval cemetery. The ground, partly sandy, partly stony, is covered with dense vegetation, among which are some baobabs. There is a small lagoon. On the same bank as Grave Island, and joined to it by a narrow strip of sand that dries 3 ft. at low water, is Kibandiko (Flower-Basket Island), surrounded with steep overhanging cliffs and

crowned with dense and almost impassable vegetation. A mile farther to west and 3 miles north-west of Zanzibar is Changuu (Changa, Chango ; Prison Island). The land, 20 ft. high, is sandy on the east side but otherwise stony. The north coast is precipitous and inaccessible, and the island is riddled with quarries. The island contains the roomy quarantine and isolation station that also serves for British East Africa. Prison Island sometimes serves as a sanatorium, and there are at the east end two Government bungalows for this purpose.

Bawe, or Cable Island, so called from the cable station upon it, lies isolated 3 miles west of the town, and forms, together with its extensive reefs, the western protection of the harbour. This island is mainly sand, and contains a large palm grove. The north coast is steep. Along the west coast, concealed among mangroves, is a series of lagoons. Both wild and domestic animals are to be found on the island.

Some 2 miles north of Ras Shangani are the ruins of Bel el-Ras, on a low rocky point. Beyond this point the coast for 13 miles trends to northward, with slight indentations, sandy bays, beaches, and low rocky cliffs to Ras Uso a Membe (Oswawembe), the north-western horn of the island. The first point of interest immediately north of Bel el-Ras is Bububu, to which the railway from Zanzibar city runs through rich tropical vegetation and plantations. A little farther north is the Sultan's country palace Chweni. The many streams and springs along this stretch of coast are used by the natives for bathing and washing, and are therefore undrinkable. About 6 miles north of Chweni begins a low-lying coastal terrace formed by a tract of coralline country, on which lies Mangapwani (Mungopani). The lighthouse called by this name is in the Bumbwini district, the fertile tongue of land that encloses the Mwanda lagoon.

Ras Uso a Membe, $3\frac{1}{2}$ miles north of the Mangapwani lighthouse, is a low cliffy point. Immediately east of this cape, and between it and Ras Mwanda, there opens out the spacious mangrove-grown bay or lagoon, into which flow the Zingwe Zingwe (Mzinga Mzinga) and Mwana Kombo rivers

Mwanda village, on an island, has a suburb or *ngambo* like that of Zanzibar city, in this case a cluster of huts on the mainland opposite, with a couple of mosques, standing at the foot of the Donge hills, 330 ft. high, and covered with coco-nut palms.

From Mwanda the coast trends north-east, skirting the fertile Mkokotoni plain, a mile or more broad, behind which rises the steep face of Mkokotoni hill, an isolated rounded height (260 ft.) that commands the coast and the island of Tumbatu. Through the ravine and to the south, which divides this hill from the Donge hills, Kipange stream flows to the sea, which it enters at Ras Mwanda. The mouth of this river, which comes from perennial springs a few miles inland, is concealed by mangroves, but its bed is easily found a few hundred yards upstream. The water is good and never fails. A number of other brooks find their way into the sea here.

Northward of Mkokotoni, up the tapering extremity of the island, are several isolated hills, the most remarkable of which, Gungodi (or Kiguguli), a coralline dome, 230 ft. high, resembles Hatajwa hill in the south part of the island.

From Mwanda to Ras Nungwe, the shore is sandy, interspersed with low cliffs. About 3 miles southward of the latter point, on the shore reef which here dries to nearly 2 miles, lie two islets.

Mkokotoni harbour, the area enclosed between the coast from Ras Uso a Membe and Ras Nungwe on the east and Tumbatu Island on the west, is a large and sheltered anchorage of about $3\frac{1}{2}$ miles in length and from 1– $1\frac{1}{2}$ miles in width, with entrances from the south-westward and northward. The southern entrance, suitable for vessels of less than 12 ft. draught only, is over a bar about $\frac{1}{2}$ mile in width, where a reef, extending southward from Tumbatu, awash at low water, leaves a narrow passage. The north entrance, between Ras Nungwe and Tumbatu, at first about 2 miles in width, narrows to about $\frac{1}{4}$ of a mile. The least depth in the north entrance, which is at its narrowest part, is about 6 fathoms.

There are many villages on the Zanzibar side of the harbour

Most of the craft trading to and from Pemba put in at Mkokotoni village. The second roadstead in quality is Magogoni (Mgogoni) to north-east of Mkokotoni. Here, on the top of the coastal terrace, at the foot of which is good anchorage for vessels of some size, are the most extensive ruins on the island, dating from Shirazian times, and perhaps marking the original site of old Zanzibar.

East coast.—Ras Nungwe, the northernmost point of Zanzibar Island, is sandy, with scrub-grown cliffs. The land behind the point is undulating and stony, covered with grass and scrub and some high trees. On a sandy spot, nestling among coco-nut palms are the huts of Nungwe village, one of several little Watumbatu colonies to be found on the horn of the main island.

South-east of Nungwe the coast first falls sharply into the sea in overhanging coralline cliffs topped by tall casuarina trees, to continue as far as Muyuni, abreast of Mwemba islet, in a line of alternate low cliffs and sandy bays. The sea breaks heavily on the fringing coral reef.

Mwemba, 9 miles southward of Ras Nungwe, is a small sandy island (the only one on the east coast) on the edge of a coral reef 4 miles long by 2 miles wide. The channel between it and Zanzibar Island, $1\frac{1}{4}$ mile wide, has depths 45–55 fathoms. Northward of the islet, under the lee of the reef, is an anchorage in about 10 fathoms over sand. Mwemba was formerly a favourite halting place of the slave dhows running to Pemba and the Arabian coast. At present a resort of fishermen, it possesses good fresh water in a small and ancient well.

The site of the Wahadimu hamlet Muyuni, facing Mwemba, and of other villages along the coast is marked by coco-nut palms. At Muyuni begins a slight bight, some 13 miles in length, the coast along which is mostly low, backed by rising ground a few miles inland. The immediate coastland has a wide stretch of sandy foreshore, suitable for the coco-nut palm. To as far as Pwani Mchangani (Shangani), a poor fishing village, the coast is bordered with small coralline plateaux and white sandy shores. South of Mchangani, high

dunes alternate with coralline rocks. The sandy shore extends to a little north of Pongwe, where a rocky terrace descends abruptly into the sea and forms the northern horn of a small bay, which here cuts into the as yet almost unindented coast.

Between Ras Urua and Chwaka (Chuaka) Head is the entrance to Chwaka Bay. Midway between the entrance point is a reef, on which the sea generally breaks. The bay is so shallow as to be, so far as navigation is concerned, nearly useless. It extends from Ras Urua about 8 miles to southward, and is 3 nautical miles wide, with low shores either sandy or mangrove-lined, and with several mangrove creeks at its head. Inland to the westward several low but abrupt isolated coralline hillocks rise above the surrounding vegetation.

On the shores of the bay are several villages, the chief of which, Chwaka, in the south-west corner, is the terminus of a carriage-road across the island from Port Zanzibar (distance $21\frac{1}{2}$ miles), and ranks as the island's chief health resort. It consists of a few native huts under coco-nut palms, to the north of which are three large Government bungalows, for the use of the Sultan and of European residents of Zanzibar requiring a change to the cooler east coast. Immediately south of Chwaka a broad creek runs far into the so-called Chwaka depression.

Directly south of the creek entrance is the coral district Cherawe, and, farther inland, to south-east, surrounded by rough coral country, in the potholes of which the Wahadimu plant bananas, is the village Mkongoroni, where are palms and a well of brackish water. Between Cherawé and Mkongoroni, in a cavity, is the mouth (decked with votive offerings) of the vanishing river Matimba.

From Chwaka Head for about 16 miles northward to Ras Makunduchi the coast is low, and consists of a strip of cultivation and trees, behind which stretches a barren plain overgrown with scrub.

The fringing coral reef extends from $\frac{1}{2}$ mile to nearly 2 miles off this part of the coast.

At Makunduchi are a few not very extensive patches of

fertile red loam that form an oasis amid the desolate stony coralline country, and Makunduchi is one of the few places in the southern part of Zanzibar Island in which the mango tree is found. The coco-nut palm also thrives.

The 8 miles of coast from Ras Makunduchi to Ras Kizimkazi bear round to the south-westward, and with the exception of a slightly receding sandy bay at Mtende, present a uniform low cliff (15–20 ft. high), backed by gently rising ground to about 70 ft.

TUMBATU, UZI, AND LATHAM ISLANDS

Tumbatu

Tumbatu, the largest adjacent island to Zanzibar, is situated on the west side of the northern horn of the main island and to NNE. of Ras Uso a Membe. Its nearest point is $1\frac{1}{4}$ mile distant from the mainland. To its north is the islet Mwana Mwana, which lies on the same reef, and, at low water, may be reached dryshod. The eastern islet, Puopo, is also on the same reef. This reef is, off the south point of the island, awash for $1\frac{1}{2}$ mile in the direction of Ras Uso a Membe, while off the east side the coral dries at an average distance of one mile, so that it greatly contracts both the south and north passages into Mkokotoni Harbour.

The greatest length of Tumbatu Island, from Ras Wedshano, the south-westernmost point, to the lighthouse on Mwana Mwana Islet, is some 7 miles; its greatest width, which is from the west to the east coast south of Mwangoni Hill, is under 2 miles. The island falls towards the sea in steep coral line cliffs, 10–15 ft. high, the rockyline being in places broken by sandy shores. These rocks also form the western boundary of the Massaniani Peninsula. The surface is flat, the rises in the north and in Mwangoni being alone important enough to be called hills; and even these barely exceed 50 ft.

Tumbatu consists almost exclusively of coralline deposits, of recent date, rocks of older formation existing in Mwangoni Hill only. The Massaniani Peninsula, on the east side of the

island, is formed of alluvial sand and mud deposits bounded on the north by a sandbar extending towards the stony Ras Kipengeleni, but in the south apparently still being laid down in the mangrove-grown Kichangani Bay.

There is sufficient humus for a dense vegetation, chiefly scrub. The Watumbatu are reputed the best sailors and pilots of the Zanzibar seas and pay more attention to fishing than to agriculture. There are nevertheless cultivated fields of native cereals, as for instance between the two villages. The betel-vine grows well on the stony soil and there are groves of coco-nut palms on Massaniani. In the southern villages are bananas and melons.

Ruins of Shirazian origin in the south of the island show it has long been inhabited. The two island villages are Jongwe in the south and Kichangani about the centre of the east coast on the bay of the same name. The narrow path connecting them runs through dense bush and grass as high as a man, past Mwangoni Hill, in the vicinity of which are the three island springs. Because of the porous nature of the limestone and the very slight rise of level on the island there is no flowing water, and these springs supply the only drinking water. They are open and rocky and dry up in times of drought, whereupon water is fetched from Mkokotoni.

The islets Mwana Mwana and Puopo show the same rocky surface as Tumbatu. The former is 50 ft. high and covered with dense scrub. Near its northern extremity stands a white pyramidal tower topped with a revolving light, 75 ft. above high water. The fertile little island of Puopo has plantations, but no habitation.

Uzi

Uzi, the largest of the islands off the south-west coast of Zanzibar, with a population of about 200 Wahadimu, seamen, fishermen, and agriculturists, has several good springs. The west side of the island is stony and bush-covered; the east side is fertile. Along this side are isolated hamlets among dense groves of mango trees, coco-nut palms, and baobabs.

The mangrove-channel, north of Uzi Island, shallow between it and Unguja ukun district (on the main island), is at low tide fordable. Near here, and possessing a landing-place, is the chief village of Uzi Island.

On the southern prolongation of the Uzi reef, and separated from Uzi Island by a channel dry at low water, is Vundwe (Wundwi), a rocky islet with tall baobab trees. It possesses a poor village, a spring of brackish water, and some cultivated fields. The southern part of the islet is bush-covered.

Latham Island (Fungu Kizimkazi)

This, the remotest island belonging to the Government of Zanzibar, is a low dangerous coral islet, situated lat. $6^{\circ} 54' S.$, long. $39^{\circ} 56' E.$, in the fairway of vessels approaching the Zanzibar Channel from the south-eastward, and is of interest to navigators only. Its surface, 10 ft. above high water, length $1\frac{3}{4}$ cable, breadth under 1 cable, affords a resort for sea-fowl. The beacon that once existed here has vanished. A sandbank, shifting from one end of the island to the other, according to the monsoon, offers an emergency anchorage.

PEMBA ISLAND

Pemba, which is about two-thirds the size of Zanzibar, resembles its sister island in geological formation. It is divided into two regions, the rich-soiled hilly western region, densely covered with tropical formation and ranking as the finest clove-producing country in the world, and the stony coralline region covering rather over a quarter of the whole area of the island.

The raised Western Region, at its highest 300–30 ft. above sea-level, chiefly consists of laterite and other formations belonging to the Mikindani series, with Tertiary limestones in a few places, as on Chake Chake Bay and at Weti.

This region is a very narrow belt, intersected by innumerable tidal creeks filled with mangrove swamps. There is no main ridge or line of hills to give character to the country. The

summits are approximately all of the same height and the ridges, which are steep and razor-backed, do not radiate from any central point, but run in all directions, generally in horse-shoe curves. The valleys are narrow and steep-sided. In their bottoms, often marshy and impassable, are brooks with either flowing or stagnant water.

A coastal terrace runs, at an altitude of 40–50 ft., more or less along the whole western side of the island. On it lie the three townships of Pemba, viz. Chake Chake Weti, and Jambangome. There is also a low-lying coastal strip of coralline limestone, and the islets off this coast also consist of coral.

The Eastern Region occupies a fairly level terrace-like foreshore that never reaches the breadth of the coralline country on Zanzibar Island, and it is far more indented on the coast. There are plenty of brooks and rivers, and consequently more extensive strips of cultivation are to be found near the villages, and there is some dense bush. Of the two terrace-like formations on the west side, the higher is reproduced on the east side.

Between the western hill district and the eastern limestone strip are sandy plains, some grass-grown, some with trees. On these plains the Wapemba tend large herds of cattle. The clove trees are far finer than those of Zanzibar (in part owing to a cyclone that in 1875 devastated Zanzibar, but spared Pemba), and the island enjoys a more favourable climate for luxuriant vegetation than its sister island, and is referred to by the Arabs as *Al Huthera*, or 'Green'. On the other hand, it is culturally the most retrograde of the large islands of Zanzibar Archipelago, and much of it consists of impenetrable bush.

Chake Chake (pop. about 1,500), the capital and trade centre of Pemba, seat of an Arab Vali, representative of the Sultan of Zanzibar and of a Resident British Official, is centrally situated, being about midway of the west coast and where the island is narrowest. It lies on the coastal terrace (here about 40 ft. high) and at the head of a long winding, narrow and difficult mangrove-fringed creek, which during the spring

tides dries completely across, though at half tide there is enough water for a steam launch. By its remote position the town in early days became important as a refuge for slavers from British gunboats. Chake Chake has a good pier, government offices, a jail, and an old fort, all close to the creek; while, on a narrow ridge, among mango trees and coco-nut palms, the native town stretches inland with a few Arab stone houses, two mosques, and narrow streets with four huts. There is an Indian bazaar. The wireless station is northward of the town, separated from it by a deep ravine.

For administrative purposes Pemba Island is divided into three districts, the northern, central, and southern—the Wete, Chake Chake, and Mkoani districts.

Wete District.—Wete district is, owing to its two long peninsulas, characterized by an extremely lengthy coast-line. In the north-east, south of the Sizini Creek, is the Ngezi Forest. The trees, chiefly varieties of acacia, are gigantic and festooned with rubber-lianas and other parasitical growths. The ground is strewn with rotting trunks, and the dense undergrowth prevents penetration outside the beaten paths.

Wete township is surrounded by a forest of clove trees, the country here nearest the sea consisting of the narrow ridges and swampy valleys characteristic of the western region.

In the south-west portion of Wete district, between Wete Creek and the head of Port Cockburn, is the greatest height to be found on Pemba Island (325 ft.).

Chake Chake District.—The western side of this district is characteristic of the western region generally. The high ground is covered with clove plantations; rice is chiefly cultivated in the marshy valleys between the hills. The few uncultivated stretches are covered with a dense vegetation, among which are numerous examples of the West African oil palm.

North of Chake Chake town there is hill country, furrowed by innumerable streams, on the Sadawabai and Mkumbuu Peninsula. This is a rich district; especially large clove and coco-nut plantations are to be found at Ras Tundana, at the

entrance to Chake Chake Bay. A small species of coco-nut palm on Pemba Island is remarkable for quick growth and nut-bearing properties.

In the north-east of the district, south of Adamson Bay and near the east coast, is a prosperous group of villages known as Kinyu. There is a variety of crops including rice and tobacco, and each house stands by itself among a dense growth of coco-nut palms, jack-fruit, mango, and banana trees. The mango tree of Pemba, which here grows to an enormous size, is important as providing the only useful timber on the island.

The Chandegi river, debouching at Vitongoge on the east coast, is one of the principal streams of the island. Before finding its way into the sea it passes through a large swamp, apparently quite stagnant and filled with giant water-lilies that grow 5 to 6 ft. above the water. Converging on this swamp and filled with the densest bush are a number of impenetrable valleys, whose bottoms are also filled with swamps in which the water has no perceptible flow.

South of Chake Chake town, between it and Jambangome, the land is even more marshy than usual, and in places uncultivated owing to the difficulty of transport; there is much impenetrable bush. On one of the hills is some grey limestone, variously described as Jurassic and Tertiary. Five miles south of the capital, near the village Tumbini, are some large sandstone boulders, used by the villagers in the foundations and walls of their houses. Among the luxuriant vegetation in the marshy depressions are raphia palms and, more rarely, clumps of tall bamboo.

Mkoani District.—This district is fertile, and is covered with plantations in the vicinity of Jambangome on Kingoji Bay, and again in the region stretching southward to Fufuni on the south coast. In the centre of Ras Kingoji, one of the largest promontories on the west coast, is the hill Siniongoni, from the top of which, in favourable conditions, it is possible to see the coast of Africa. Between Jambangome and Fufuni rises Mizi Miombe (or Three Feet Hill), alt. 304 ft., covered with dense bush and surrounded by clove plantations.

Chokocho, the south-westernmost portion of the island, is one of the outlying marshy or less fertile districts into which the aboriginal Wapemba have withdrawn before the advance of the Arabs.

Coasts

The coast-line is extremely long for the small surface area. The west coast is most deeply indented, a series of branching bays running far up into the western hill country and forming good harbours, chief of which are Chake Chake Bay, Port Cockburn, and Port George, or Weti Harbour. These are protected from the sea by a chain of coral reefs and outlying islands that form a natural breakwater, broken by more or less intricate passages. The very name Pemba is derived from a Swahili word meaning 'approach carefully', and it is this coast that long afforded Arab slave dhows a shelter, and to this day helps to make Pemba a stronghold of Arab conservatism.

The bays are prolonged inland by a multitude of creeks in which are the mouths of mangrove-grown streams. The mangrove is also found in the sand on the open coast. This renders landing difficult, and the shallowness and extent of the reefs frequently render the bays little more than a series of lagoons. The east coast is, in comparison, straight, open, and harbourless.

The southernmost point of Pemba is Ras Upembe (Nassoon Point) (lat. $5^{\circ} 29' S.$, long. $39^{\circ} 44' E.$), a bold cliffy point, 72 ft. high, with a small sandy beach on its east side. Upembe Passage is a narrow reef-encumbered channel much used by boats and dhows, which thus avoid rounding the point. Observation Point and South Ras Domoni, as also the entrance of the passage north of Ras Upembe, have overhanging coral cliffs. The channel between these points is nearly dry at low water.

About 2 miles north-westward of South Ras Domoni is Fufuni, or Kangani village. The harbour (with customs house) is poor and only accessible at high tide; the drinking water is bad.

The south-western group of islands, Yombi, Pansa, Matumbeni, and several others, are practically one island, being separated from each other only by mangrove creeks navigable by boats at high water. The islands are all thickly wooded and about 100 ft. high. Pansa, the largest of the group, has several villages along its north-eastern coast; the others are mainly uninhabited. Makungwe, the north-easternmost of the group, a slightly hilly island about $1\frac{1}{2}$ mile in length, most of which is cultivated, is also inhabited. There is an anchorage for small vessels $1\frac{1}{2}$ mile northward of the naval dépôts at Pochin Beach, where there is fresh water. On the island are some Shirazian ruins. Between Makongwe and the main island is the north-west entrance of the Upembe Channel.

On the Pemba coast to north-east of Makungwe Island, on a bluff above the sea, is the small post Mkoani (there is no township), surrounded by fertile country covered with plantations.

Kingoji Bay (Jambangome or Yambugomi Creek), between North Ras Domoni (Ras Kionwa) and Ras Kingoji, is at first 2 miles wide, but the navigable channel narrows considerably between the points and the reefs projecting from them. Ras Kingoje is a low point rising inland to 181 ft. At the head of Kingoje Bay is the township Jambangome, at a distance of about 10 miles by land from Chake Chake.

Chake Chake Bay is included between Ras Kingoji, the reefs of Mesale Islet, and Mkumbuu Peninsula, and extends about 5 miles eastward, with a general width of about $2\frac{1}{2}$ miles, gradually contracting until it terminates in a creek on which stands the town of Chake Chake. Though shoals are numerous in Chake Chake Bay, it is the best harbour, having large and clear spaces with convenient depths, and offering a shelter to ships of all size whatever wind may be blowing. The best entrance (which is better than any into Zanzibar harbour) is from the south-west. The shores of the bay are cultivated with coco-nut palms, clove trees, and cereals. Ras Tundana, 3 miles north-eastward of Ras Kingoje, with Ngelema Bay between (which affords good anchorage), is a low point,

mangrove-fringed. Ras Banani, $2\frac{1}{2}$ miles east of Ras Tundana, also with a bay between, is low and has some bush on it. Near it lies the Indian Mission Station Banani. To the south-west are the great clove and coco-nut plantations of the Government of Zanzibar.

Directly west of Chake Chake Bay, and commanding both entrances, is Mesale, the first of a long chain of reef-surrounded islands extending to the north. The islet, which is almost a mile long, covered with dense forest, waterless and uninhabited, is supposed to contain the buried treasure of the notorious buccaneer Captain Kidd, who at one time made Pemba his head-quarters.

Mkumbuu Peninsula, forming the north side of Chake Chake Bay, and dividing it from Port Cockburn, is a narrow, reef-surrounded neck of land about 50 ft. high, on which grow some palms. Its western extremity consists of mangroves. On its south side, a patch of bright red sandstone, is Dongo Kundu, which affords navigators a landmark.

Owen Channel, leading round the head of Mkumbuu Peninsula into Port Cockburn, is deep, with 7 fathoms at its narrowest point. The outlying reef is marked by some narrow and rocky islets.

Port Cockburn is a harbour of great capacity, with depths sufficient for all classes of vessels, but is much obstructed by reefs, and in many places inconveniently deep. Its best entrance is by Owen Channel. Its second entrance, by the Kokota Gap, between the islands and reef that shelter the harbour on the west, is used by small steam-vessels. On Ras Kinazini, a point jutting far out into Port Cockburn, is a big village that supplies anchoring ocean vessels with provisions.

Of the outlying islets, Kokota, with Kokota Gap and Uvinje Gap on either side, is about 50 ft. high and has a rocky surface covered with vegetation. Funzi Island, inhabited, has a central plateau, 40 ft. high, covered with lofty palmyra and coco-nut palms. There is a well in the north, and a cemetery on the east side, this island having served as a naval dépôt. Pemba Island resembles Funzi, but has more man-

groves round it. Lepers are here segregated by the Government, and in the north of the island is Mdoni, a village of about 50 lepers. •

Port George (Weti Bay), a large harbour somewhat similar to Port Cockburn, is sheltered on the west by Uvinje and the southern portion of Fundu Island. The northern part of the harbour, known as Weti Harbour, which ends in the crest of the same name, is shallow east of Ras Tungwe. The principal entrance into Port George is through Uvinje Gap (between Kokota and Uvinje islands), which is only suitable for vessels of moderate draught. The other entrance, from the north, can only be navigated by vessels of about 10 ft. draught. There are good anchorages both in the main harbour and in Weti Harbour. Weti Bay is encircled by fertile and hilly country, with numerous streams and plantations.

On the north side of Weti Creek is Weti Township, in importance the second Customs House station of Pemba Island, seat of an Arab Vali, and inhabited by many Indian traders. It lies on the coastal terrace above the mangrove-fringed sea-shore, the banks of which, some 8 ft. high and of yellow sandstone, are covered with thick vegetation. There are two piers, 100 and 250 yds. long.

Of the islands on the outer reef, Uvinje, which is rocky and waterless, is covered with scrub and has some coco-nut groves and tall casuarina trees. On its west side are several sandy coves. Fundu, the largest island off the west coast of Pemba and a favourite resort of the Pemba Arabs, is $5\frac{1}{2}$ miles long and about half a mile wide and flat. On the east coast are some villages, and there are extensive plantations and at least two springs. On its west side are several small sandy bays. Haramu Passage, between Fundu and Uvinje, is dry at low water, but affords a boat passage during spring tides.

The passage from Port George northwards to Port Kishi Kashi is shallow and suitable for vessels of over 10 ft. draught. Port Kishi Kashi, a deep and well-sheltered harbour, is intricate, being greatly obstructed by reefs. Its entrance is from the north by Fundu Gap, a narrow and dangerous channel.

The village of Kishi Kashi, at the head of the harbour, is the residence of the chief of the Pemba Arabs, who owns all the north part of Pemba Island. There are large clove plantations in the country around.

Njao Island, about $2\frac{3}{4}$ miles in length and covered with bushes and trees, resembles Fundu Island, and is inhabited and cultivated, but has no well, and drinking water has to be brought from the main island.

To north, through Njao Gap, is the entrance to Port Kiuyu, which is a more convenient harbour than Kish Kashi, the entrance being wider and the clear space inside larger. The shallow creeks that indent it are less thickly populated than those of harbours farther south.

From the north side of Njao Gap, the coast trends northward in nearly a straight line for $5\frac{1}{2}$ miles to Ras Kegomacha. It is low and tree-covered, with occasional small sandy bays.

Ras Kegomacha (Kigomasha) (lat. $4^{\circ} 52' S.$, long. $39^{\circ} 41' E.$), the north extremity of Pemba Island, is rocky, and carries a lighthouse, the lights of which are 125 ft. above high water. The fringing reef of the point dries for 2 miles north-eastward, and is continued by a shoal. Inward is virgin forest.

Between Ras Kigomasha and Ras Kiuyu, the north-west point of the island, lies the curious north coast, the indented line of which is fringed by a broad reef, while at a greater or less distance from the island is a number of isolated reefs, the so-called Pemba Knolls.

Msuka Bay, the broad indentation immediately east of Ras Kegomacha, affords good anchorage between the encircling reefs. This is a building place for dhows. Farther eastward the Sizini (or Sisini) and Kiuyu Creeks run deeply into the east part of the north coast.

Sizini Creek, about $4\frac{1}{2}$ miles south-eastward of Msuka Bay is a long but shallow inlet with several islands, and affords good shelter for small craft. Between it and Msuka Bay are coastal villages and the country is well cultivated. On Sizini

Creek lies Sizini, near which are four small fresh-water lakes nearly covered with water-lilies.

The district north-east of Sizini consists of a karst-like limestone country with potholes. The stony ground is covered with low bush and only now and again cultivated for manioc. The chief village seems to be Maziwa Ngombe. A chain of reefs and islands runs close to the west coast of this strip of coralline country.

Ras Kiuyu, the northern extremity of the east side of Pemba Island, is a rocky bush-covered promontory faced by cliffs some 20 ft. high. Southward the coast continues straight, cliffy, with a few sandy beaches and covered with scrub and trees ; to seaward is a steep-to coral reef.

Adamson (or Kojani) Bay appears to have no passage from seaward in the north, the reef not breaking across the broad entrance here. But $4\frac{1}{2}$ miles southward a channel (Mchengangazi Pass) almost a cable wide breaks through the reef and leads into the bay. Ships can enter $1-1\frac{1}{2}$ miles. On Kojani, the island thus formed, is the enclosed Wapemba village of the same name, the larger village on the east side. There are here some relics of Shirazian ruins.

From Mchengangazi Pass to Mtangani the coast for 17 miles consists of overhanging coral cliffs and a few sandy beaches. The fringing reef is often broken, and there are several small indentations.

Mtangani, where is a clearly defined break in the reef about 150 yds. wide, can be entered by small craft. Over a mile within is an anchorage, south-westward of which a boat passage leads to Kiwani, and from there to seaward again by Mkiwani Channel. This channel, which is 3 miles southward of Mtangani has a depth of 6 ft. on its bar at high water, but the narrowest part of the channel, although deep, is only 14 ft. wide. It is used by small dhows.

The coast from Mtangani to the main entrance of Upembe Passage, a distance of about $7\frac{1}{2}$ miles, consists of overhanging coral cliffs some 15 ft. high, thickly wooded, and fringed by a reef.

VEGETATION OF ZANZIBAR AND PEMBA

The flora of Zanzibar and Pemba is typically East African, being closely related to that of the neighbouring mainland, and there are few indigenous plants. Five zones of vegetation can be distinguished : (a) the mangrove swamps of the coast and brackish creeks, (b) the sand and rock plants of the shore, (c) the scrub-bush which covers a large area of poor and stony coral land mostly in the east of both islands, (d) the bush steppe or ' dry savannah ', and (e) the rich tropical flora which flourishes on the fertile red clays and loams of the interior and western uplands. Both in Zanzibar and Pemba this fertile belt is now closely cultivated, and only scanty vestiges of its original vegetation remain. It is the only region of the islands which receives enough moisture to support a luxuriant tropical flora. Elsewhere the dominant plant forms are xerophytic. Though the climate of Pemba is much damper than that of Zanzibar, its vegetation, generally speaking, is the same ; and all that is here said is intended to apply to both islands.

(a) *Mangrove associations.* The mangrove association is composed of three groups of plants. First, there are the true mangroves, growing in water and forming considerable groves, which often extend far out to sea, and are only fully exposed at ebb-tide. The principal species in this group are the widely distributed *Rhizophora mucronata* or mkoko, growing from 15 to 36 ft. in height, and *Sonneratia caseolaris*, the finest of all the mangroves. Both are deep-water trees. In shallower positions *Ceriops candolleana*, about 15 ft. high, is common, and *Avicennia officinalis*, a shrub of 8 to 12 ft. high, forms extensive osier-like thickets. None of the mangroves of Zanzibar grow to the normal size of those in the forests of the mainland. Secondly, there is a zone of succulent plants and shrubs, growing mostly on the tidal land behind the mangrove jungle. Here the marshy surface is often covered with the stiff dune grass, *Sporobolus virginicus*, and more sandy ground with masses of low-growing *Sesuvium portulacastrum*, used

by the natives as a vegetable, and *Arthrocnemum indicum*. These often border the *Avicennia* jungles, and even penetrate between the mangrove trees. The flats just above high-water mark are usually clothed with the sedge-like *Scirpus setaceus* or *Sporobulus* grass. The succulent *Pemphis acidula*, one of the most characteristic and widely distributed shore plants, often forms large bushes near the lagoons. The beautiful giant fern, *Chrysodium aureum*, or mkecho, growing to a height of 10 ft., is a feature of salt marsh vegetation of this kind, and sometimes forms a compact jungle separating the mangrove belt from the land. The shrubs, *Hibiscus tiliaceus*, and two species of *Thespesia*, are associated with it.

In Zanzibar the finest mangrove swamp is in Chwaka Bay, on the east coast, where it fills three deep creeks, protected from the surf by the Michamwi Peninsula. It consists mainly of the deep-water species, *Rhizophora mucronata* and *Sonneratia caseolaris*. On the west coast the most extensive mangrove belt lies on the north side of the Uzi Channel, and entirely blocks its original north-western exit. Another large forest completely fills the head of Kiwante and Kumbeni Bays, and runs for some distance inland. The sea-ends of the belt of swamps which encircle the town of Zanzibar are also covered with mangrove vegetation, mostly of the shallow type. Mangroves, principally *Avicennia*, thrive at the mouths of the many small streams which enter the sea north of the town. The chief mangrove region, however, is the Mkokotoni district on the north-west face of the island. Here the great Mwanda lagoons, choked with trees, stretch far inland, whilst under the shelter of Tumbatu Island the deep-water species extend far out to sea.

(b) *Beach and rock vegetation.* The most characteristic plant of the sandy strips above high-water mark, and the bars of the bays and rivers, is the shore bindweed, *Ipomoea pes caprae*. Its network of fleshy leaves and violet blossoms covers large areas, the long rooting tendrils binding the loose sand together and helping it to resist the action of wind and surf. The principal trees of the shore are the thorny-leaved

screw pine, *Pandanus kirkii*, and the curious *Casuarina equisetifolia*, which grows to a height of 90 ft. With them are associated *Scaevola lobelia*, *Pemphis acidula*, and other xerophilous shrubs, which often form extensive thickets. *Sporobulus* grass, and the reed, *Cyperus maritimus*, with long underground runners, are characteristic members of this association, which is conditioned by salt air, a salt and unstable soil, and constant struggle against wind and waves. It is found principally on the east coast of Zanzibar, where the long white sand beaches are beaten flat by the action of the monsoons, but also appears on the sandbars and in the shallow bays of the western space.

Where limestone cliffs form the coast-line, e. g. on parts of the eastern and southern face of Zanzibar and some of the adjacent islands, and the air is charged with salt from the heavy surf, a restricted number of succulent plants have managed to obtain a footing. The most conspicuous is the tree euphorbia or ngofu (*E. nyikae*) of East Africa, which here grows to a height of about 30 ft. Other euphorbias are associated with it. The shrubs, *Guetarda speciosa* and *Pemphis acidula*, and the tree, *Casuarina equisetifolia*, are members of the sand-shore association which reappear in this group, and are specially numerous on the east coast cliffs: Of the many succulent creepers, the most conspicuous is the large white convolvulus (*Ipomoea glaberrima*). The red amaryllis (*Haemanthus multiflorus*) and epiphytic orchid *Angraecum giryamae*, are noticeable among the flowering plants. The inner margin of the shore, where it merges in the bush, is a region of scattered low-growing shrubs ; among the most common being the yellow-flowered composite *Psiadia dodoneifolia* and the white-flowered *Triainolepsis hildebrandtii*. On the east coast, *Mimusops fruticosa*, a bush about 20 ft. high, is a characteristic plant of this zone. Inland stragglers from the sandy beach include the screw pine, euphorbia, and mkomoe (*Caesalpinia bonducella*). The wild date palm or mkindu (*Phoenix reclinata*) is a common denizen of the bush, fringing both mangrove-swamp and shore.

(c) *Scrub-bush*. The poor and stony coral soil which covers about half the total area of Zanzibar (chiefly in the east and south-east), a quarter that (chiefly in the east) is almost entirely clothed with a stunted xerophytic bush vegetation, called by the natives *situ*. It is characterized by the abundant presence of *Psiadia dodoneifolia*, which covers large areas to the exclusion of other vegetation, and other hard-leaved shrubs, forming dwarf copses, and the almost total absence of creepers. This association reappears on the small stony islands west of Zanzibar. Here and there, e. g. in the centre of the south-east peninsula of the main island, the bush, usually only a few metres high, assumes the proportions of forest, and contains trees 50 or 60 ft. high, such as *Apodytis dimidiata*, *Mystroxylium aethiopicum*, and the rare *Euphorbia volkensii*, which is peculiar to this formation. In parts it is so dense that porters can hardly carry their loads along the narrow paths. There are practically no grasses or small plants, and the bare rock frequently appears between the shrubs.

(d) *Bush-savannah*. This association originally occupied a broad belt running from north to south of Zanzibar, and corresponds with the highest and oldest terraces, but is now somewhat reduced by the spread of cultivation. Its general character is open bush, interrupted by patches of dry grass land. The number of species represented is few, and their distribution uniform. They are mostly dwarfed by lack of water. Perhaps the most distinctive is the tope-tope (*Anona senegalensis*), a xerophilous plant, which here has the habit of a stunted fruit tree, growing about 15 ft. high. The fruit is edible. Amongst the many other shrubs, *Vitex cuneata* is the most showy. Though generally only a few feet high, in moist situations it shoots up into a large tree. The majority of the plants have simple, leathery leaves, with special adaptations to prevent evaporation. The baobab (*Adandonia digitata*), and less frequently, the tree euphorbias, occur in this zone. The fruit of the baobab is eaten, and native sandals are made from the bark. The eagle fern (*Pteridium aquilinum*) grows in enormous clumps, and in stony places the rock ferns,

Pteris longifolia and *Polypodium phymatodes*. The grasses of the bush-savannah are characteristic. The most abundant and important is *Andropogon contortus*, growing 18 in. high. The tall species, *A. rufus* and *Pennisetum setosum*, both over 6 ft., flourish in the more open localities. Amaryllis lilies, ground orchids, and other flowering plants occur in the grass lands.

(e) *Tropical vegetation*. The rich deep soil on the western side of Zanzibar and Pemba was originally covered with a dense evergreen jungle of tropical plants, extending inland from the coast to the western highlands; but the greater part of this has now been ousted by cultivation, its place being taken by the great plantations of coco-nuts and cloves and by the shambas of native agriculturists; and its original character has to be reconstructed by comparison with the vegetation of the mainland. The climbing plants and lianas have survived best, as they now form hedges between the fields. They include the rubber-giving *Landolphia kirkii*, which is indigenous in the dense alluvial forests of north-west Pemba. The African almond (*Terminalia catappa*) extends through both islands. Among the shrubs are *Uvaria kirkii*, *Chasalia umbraticola*, *Asparagus falcatus*, and other East African species. On cleared ground the ilook-grass (*Imperata koenigii*), with creeping roots and a rank growth, is a common and tiresome weed. It is in the many fresh-water swamps and deep watercourses of west Zanzibar and Pemba that the luxuriant native flora is now chiefly found. Here marsh grasses and the lesser *Cyperaceae* flourish, and blue *Nymphaea* cover the lagoons. Papyrus growing 10 ft. high often forms a thick jungle in the stream beds. Tree bamboos (*Typha latifolia*) and solitary mkindu palms are common. The oil palm (*Elaeis guineensis*) grows wild in many parts of Zanzibar and the moist valleys of Pemba. Associated with these are the Raphia palm (*Raphia ruffia*), and the giant reed, *Typhonodorum Lindleyanum*, with huge arrow-shaped leaves 6 ft. high, forming large thickets which often overgrow the streams. The most common fern is *Aspidium unitum*, which

frequently chokes the springs. Among the many flowers of the swamps are lobelias, hibiscus, and passion-flowers (*Adenia gummifera*) growing on tall, thick-stemmed lianas. Besides this semi-aquatic association there are many true water plants, such as *Pistia stratiotes* and *Utricularia inflexa*, and a number of fresh-water *algae*. Many of the large swamps, however, have now been reclaimed, and are cultivated with sugar-cane, rice, &c. The annually flooded alluvial land bordering the watercourses is generally covered with elephant-grass (*Pennisetum benthami*) growing 12 ft. high, wild millet (*Andropogon sorghum*) 6 ft. high, and other tall grasses up to 18 ft. These conserve the moisture of the ground in times of drought. Among them the graceful Deleb palm or mvumo (*Borassus aethiopum*) growing singly or in small groups, rises to a height of 30 to 100 ft., its slender trunk crowned with a tuft of fan-shaped leaves.

FAUNA

The fauna of Zanzibar and Pemba has few features of special interest. It is generally identical with that of the mainland, but the number of species represented is much smaller. Save for the occasional visits of cruising hippopotami, there is a total absence of big game animals. The principal carnivora are the civet-cat (*Viverra orientalis*), which is common, and the serval (*Felis serval*) found in the southern bush. The only antelope appears to be one species of duiker.

Such wild life as now exists is found principally in the south and south-east of the main island. This was the home of the Zanzibar silk-monkey (*Colobus kirki*) which was peculiar to the island, but is now believed to be extinct. It is still inhabited by the green bush monkey or kima (*Cercoptes albigularis*) which is fairly plentiful. In the plantations is found the night lemur or komba (*Galago crassicaudatus*). From the economic standpoint the most important mammal is the bush-pig (*Potamochoerus africanus*), which is unfortunately very common, and causes great

destruction in the cultivated areas. Among small mammals, shrews, of which there are three species, do a useful work in destroying the coconut beetle and other insect pests. Rats, including the hamster rat (*Cricetomys gambianus*) swarm in Zanzibar town. The common species are *Mus rattus*, *M. alexandrinus*, and *Epimys norvegicus*. One hyrax (*Dendrohyrax neumanni*), one ichneumon (*Bdeogale tenuis*), and three species of bat have been identified.

The birds are mostly common African species, such as the white-backed crow (*Corvus scapulatus*), reef-heron (*Leptorodius gularis*), black and white hornbill (*Lophoceros melanoleucus*), bush-shrike (*Dryoscopus senegalensis*), and innumerable weaver-birds, bishop-birds, and whydahs, which feed voraciously on the cereal crops. The Zanzibar wood-pecker (*Dendropicus zanzibari*) alone appears to be peculiar to the island. The dusky-headed parrot (*Poeocephalus fuscicapellus*) and Madagascar love-bird (*Agapornis cana*) are found among the trees, with the wood hoopoe (*Irrisor crythrorhyncus*) and various brilliantly coloured rollers and sun birds. Four species of kingfisher have been identified. The principal game bird is the guinea-fowl; but the fruit-pigeon (*Vinago delalandei*) is also edible. On Pemba, guinea-fowl, kites, and white-backed crows are said to be the chief remaining birds.

There are several species of non-poisonous snakes. The principal venomous species—not common—is the spitting cobra (*Naja nigricollis*) which has been found on Pemba. The puff-adder (*Bitis arietans*) and a viper (*Atractaspis rostrata*) are also said to exist on the islands, but if so are extremely rare. Pythons are often found in the swamps. Other reptiles include the great lizard (*Varanus niloticus*), the chameleon, and some smaller species. Frogs (*Xenopus*) are very common.

In contrast with the poverty of land animals the number of marine fishes found off the coast is surprising. Over 420 species have been identified in the Zanzibar waters and neighbouring seas. Of these, 192 are also found in the Red Sea, 108 off the East African islands, 7 in Cape waters, 125 in

the Atlantic, and 3 in the Mediterranean. Large beds of the mother-of-pearl oyster (*Margaratifera maxima*) are found off the east coast of Zanzibar, and of the inferior kind called lingah (*M. vulgaris*) in the shallows near both islands.

Fresh-water fish are also plentiful, and mostly identical with those of the rivers and swamps of Tanganyika Territory. Among the principal species are *Kuhlia rupestris*, the cat-fish *Clarius mossambicus* and *C. guntheri*, and eel-like *Plotosus anguillaris* two barbels (*Barbus kerstenii* and *B. zanzibaricus*), a goby (*Gobius giunis*), and the interesting and important mud-fish of the swamps, *Protopterus annectens*.

Insect-pests are numerous. The damp climate and many swamps are favourable to mosquitoes, which are specially abundant on Pemba. Sixteen different species have already been identified, and include several carriers of malaria. The common mosquito of Zanzibar town is *Anopheles costalis*. *Culex fatigans* and *Stegomyia fasciata* are also generally prevalent. These three are the most abundant species on Pemba. Mosquitoes are most numerous from April to June inclusive, and are the cause of much illness. During 1912, the permanent swamps of Zanzibar were stocked with the anti-mosquito fish (*Haplochilus playfairii*) from the Seychelles; and these seem to be giving good results. For further measures taken to control the mosquito plague, see Health Conditions.

Gadflies (*Tabanidae*) are numerous, particularly after the rains. The most common and vexatious species are the vicious *T. taeniola*, which inflicts a maddening bite on both men and cattle, but does not molest sheep and goats; and *T. biguttatus*, which confines its attentions to cattle, feeding on the hump. Other fierce and common biting flies are *Chrysops longicornis*, which gladly and persistently feeds upon human ankles, inflicting a painful wound, and *Stomoxys calcitrans* swarming everywhere in the neighbourhood of cattle. Both attack man and beast indifferently. Tsetse flies have not so far been found in Zanzibar or Pemba.

Among insects preying upon economic crops, by far the most

important is the Rhinoceros beetle (*Oryctes monoceros* and *O. boas*) which is a curse in the coconut plantations (refer to *B. E. A.*, Industries). The bamboo-beetle (*Dinoderus minutus*) is highly destructive, reducing bamboo structures which it attacks to dust in a few days. Termites are ubiquitous, and are the worst of all timber pests. They attack and destroy mangrove and almost all European woods. Indian teak resists them best.

Coming to animal parasites, ticks swarm upon the cattle, especially the town herds and those brought from the Benadir coast. The human fever tick, however, is not found on the islands. Fleas and lice are common pests among natives.

•

CHAPTER III

INDUSTRIES

Agriculture—Live Stock—Fisheries—Animal Products—Mining—
Trade Statistics

AGRICULTURE

ZANZIBAR and Pemba are for their size the richest agricultural areas in East Africa. Both islands are sharply divided into the fertile loamy land of the western coast and undulating interior, which is entirely under cultivation, and the coral limestone of the eastern side, most of which is covered with scrub-bush and almost devoid of inhabitants; its main products being a few wild date and coco-palms, which grow upon the shores. Zanzibar, with an area of 371,371 acres, has 187,000 acres of this scrub on coral outcrop; Pemba, with 228,000 acres, has 56,000 acres of bush. Much of this scrub-land consists of bare rock; but where this is covered by a shallow soil, it is under intermittent native cultivation, principally millet, maize, peas, and beans. Chillies, tobacco, and betel pepper grow on the better tracts, and mangoes and paw paws near the native villages. The fields are sometimes hedged with Congo pea, more often walled against the depredations of wild pigs. This agriculture is mostly in south-eastern Zanzibar. The flat eastern region, exposed for five months of the year to the full violence of the south-west monsoon, is practically sterile.

The remainder of the surface of both islands, that is to say, their central and western districts, the low hills which form the backbone of Zanzibar, and the undulating interior of Pemba, is closely cultivated. Most of the accessible arable is devoted to cloves and coconuts, which are the chief economic crops. Cloves do best inland; coconuts both inland and on the coast. The most fertile region of Zanzibar lies

between the Mkokotoni district in the north of the island and the latitude of Zanzibar town. At Mkokotoni, east of Mwanda Bay, is the largest of all the coconut plantations. North of this district the country is mainly grassland with a few native clearings. The whole of the rising ground which forms the core of the island is densely planted with tropical products; cloves and coco-nuts where the soil is appropriate, elsewhere cassava and other native ground crops. Jack-trees, mangoes, and areca palms are seen everywhere. There are clumps of bananas on the moister ground, especially near the villages, which are often hidden in coconut groves. The soil varies from heavy red and chocolate loams well suited to cloves, through yellow clay to grey and black sandy loam. Stiff black loam on a clay subsoil marks the site of the old sugar plantations. The general appearance of all this region is very luxuriant. The many large mangoes, which resemble park oaks in their habit of growth, the clove plantations, and the clumps of various palm-trees, give the landscape a wooded character. The fields and plantations are hedged mostly with shrubby euphorbia or mulberry. Field paths are often bordered by pineapple thickets. There is no doubt that a wider range of tropical plants than has yet been attempted would flourish here, but so far no one has had sufficient enterprise to make the necessary trials. The intense indolence of the natives, who care merely to supply their own immediate needs and resist all invitations to manual work, is a bar to any real progress; and since the abolition of slavery, plantation owners have had a constant struggle with labour difficulties.

Native agriculture is largely performed by women. It consists of little more than hoeing and weeding; the chief implement being the jemb, which is something between a spade and a hoe. No ploughing or manuring is done. Land which becomes exhausted is abandoned, and a new plot cleared. In the native gardens, bananas, sweet potatoes, Congo pea, pumpkins, tomatoes, and castor-oil plants are the most common products. Cassava, the staple food, is a field crop.

The south-western part of Zanzibar, from Zanzibar town

to Ras Yeketekamba, is also entirely under cultivation, chiefly with coco nut and cassava. Rice is grown in some of the swamps. The great south-eastern peninsula is inferior to the central districts, but contains several rich cultural oases. The best lies along the Uzi channel, from Unguja Mkun to Mwangoni, where the fertile red loam reappears. Coconuts and other palms grow well here. On the rising ground at Mackunduchi, on the south-east coast, there is a patch of good arable, and coconuts, mangoes, cassava, and millet are grown.

The agricultural resources of Pemba resemble those of Zanzibar, but are much more developed. Two-thirds of the total area is under cultivation, as against one-fifth in the main island. The soil in the fertile west and centre varies from a friable grey loam, which suits coconuts, to a rich red and chocolate earth, which makes perfect clove land. The vegetation is luxuriant. The interior of the island, which mostly consists of low hills and swampy hollows, of chocolate loam, is largely given up to clove plantations, which are twice as extensive as those of Zanzibar, and contain a number of old trees of great size. Coconuts also flourish, but are here of less importance. The oil-palm grows well in the swampy valleys, which are also well suited to rice cultivation, though this crop is not much grown as yet. Cassava is extensively grown by the natives, whose shambas occupy about two-thirds of the arable. Magnificent jack and mango trees, with oranges, kapok, and clumps of bananas, are seen near the villages. Pineapples grow well on the heavier soil.

A large number of weeds annoy the agriculturist in both islands. These are mostly relics of the indigenous flora which have survived in the cultivated areas. By far the worst is the fibrous ilook-grass (*Imperata koenigii*), which spreads everywhere, and grows high and rank on good soil, matting the surface of the ground. It is exceedingly harmful to the roots of coconuts if allowed to gain a footing in plantations, and quickly covers fallow land. Besides native plants, a considerable number of weeds from the mainland have

become naturalized; and thanks to the slovenly methods of native cultivators, are widespread in the arable districts.

Agricultural success in these islands, from the point of view of the planter, seems to depend largely on industrious and intelligent supervision. The Arab landholders who made fortunes out of clover and coconuts in the days of slavery, are now mostly impoverished; and in many cases merely the bailiffs of Indian traders to whom they have mortgaged their estates. Having no command of capital, they are unable to develop their shambas, most of which are deteriorating. On the other hand the Government, which now administers 76,000 acres (the former property of the Sultans), is able to work them at a profit. These Government shambas include 1,400 acres of coconuts in Zanzibar and 350 acres of cloves in Pemba. They are controlled by the agricultural department. In 1915, this department paid the whole of its working expenses from the profits of the clove plantations alone.

The following table represents the agricultural situation in 1916 :

	Zanzibar.	Pemba.	Total.
Total acreage	400,000	245,000	645,000
Cultivated	80,000	160,000	240,000
Cloves	20,000	40,000	60,000
Coconuts	30,000	15,000	45,000
Native crops (intermittent)	30,000	105,000	135,000
Uncultivated	320,000	85,000	405,000

The above are round figures, as given by the Blue Book. The real acreage is rather less. Clove plantations are diminishing, and according to the latest reports do not exceed 52,000 acres in all.

Cloves

Cloves (*Caryophyllus aromaticus*), Swahili garafu, are the most important product of Zanzibar and Pemba, and the chief source of revenue. The industry dates from early in the nineteenth century; but in 1872 a hurricane devastated Zanzibar, and most of the existent trees in the island have been planted since that date. Pemba escaped; and there the large plantations contain trees of 60 to 90 years of age. These

enormous old trees run to 60 ft. in height, with a circumference of $4\frac{1}{2}$ ft., and a foliage spread of 25 ft. or more ; whereas in Zanzibar the average height is not more than 25 ft.

The estimated area under cloves at present is not more than 52,000 acres, of which two-thirds is in Pemba. There are about 4,700,000 trees in bearing. The large plantations are mostly owned either by Government (3,678 acres) or by Arabs, a few by Indians. Most of the Arab plantations are mortgaged to the hilt to Indians, who could foreclose, but prefer to keep their Arab debtors in a state of servitude, and take the profits. Many natives have small shambas. A mature and healthy plantation is valued for sale at 6 to 12 rupees per tree, which works out at £39 to £78 per acre of 98 trees. The area under cloves seems to be decreasing. Since 1912 there has been hardly any fresh planting except in the Government shambas. Many of the plantations, especially in Pemba, are deteriorating. The economic position of the landowners is bad, and the war has further damaged the industry. The labour difficulty, which has been growing ever since the abolition of slavery, is now acute, and cultivation is almost wholly done by tribesmen from the mainland. Much of the crop is often lost for want of harvesters. If cloves are again to become prosperous, it will probably be through the gradual substitution of European for Arab and Indian ownership. It is now possible for the European planter to live on the coast, and visit his inland plantations by motor.

Cloves do best on a stiff soil, either red clay or heavy chocolate loam. Best of all is loam overlying yellow clay, as in Pemba. They like flat land best. The young trees are raised in nurseries, and planted out at a year old. A large proportion die ; and a nursery must be kept running for five years after the first planting. The trees, which should be 30 ft. apart, are not pruned, and no catch-crops are grown. They come into bearing in the seventh or eighth year, earlier on very rich land, and become profitable at the tenth year. The clove is the calyx and ovary picked immediately after the fading of the corolla and before the development of the

fruit. The picking of these 'buds' begins in August, and usually lasts four months, each tree being picked over about three times. The yield is most uncertain. The trees bear heavy crop; every three to five years. A plantation of 3 000 trees averaging 60 years old, under European management, should yield 8 lb. a tree; but some of the giant trees on Pemba will yield as much as $3\frac{1}{2}$ to 4 frasilas (frasila = 35 lb.) of green cloves each. The picking of such a tree will occupy six men for a whole day. The cloves and stems are gathered together and then picked apart, and dried in the sun for 6 or 7 days. Green cloves shrink to half their weight in drying. Zanzibar cloves, which are large and red, and known as 'Zanzibar red-heads', are well dried, and do not deteriorate in store. Pemba cloves, which are smaller and blacker, generally arrive damp from the transport in dhows. They must be sold quickly, as they lose weight in drying out. Before the war there was a brisk export in the clove-stems, chiefly to Hamburg. This has ceased, but will probably revive. In very good seasons the pickers do not trouble to harvest the stems. Cloves are put up for export in bales of 140 lb., and pay an export duty of 25 per cent. The red Zanzibars command the best price, but always fetch considerably less than Penangs. There is a large trade with India.

The average recent output is stated at 14 million lb. yearly, but during the last five years has been 20 million lb. Of this Pemba contributes about two-thirds. The largest recorded crop (1911-12) was 28 million lb., of which 20 million came from Pemba, and the smallest (1912-13), $4\frac{3}{4}$ million lb., of which $3\frac{1}{2}$ million lb. came from Pemba.

The following are the figures for the last 5 years :

Season (July 1- June 30).	1913-14.	1914-15.	1915-16.	1916-17.	1917-18.
Cloves (lb.) :					
Zanzibar .	5,095,510	6,752,127	4,957,399	7,305,165	2,326,686
Pemba .	22,333,290	11,598,611	22,929,059	10,602,200	8,096,671
Total .	27,428,800	18,350,738	27,886,458	17,907,365	10,423,357
Price per fra- sila of 35 lb.		Rs. 8-54 to 11-02	Rs. 8-19 to 10-27	Rs. 9-91 to 11-51	Rs. 10-37 to 27-56

Coconuts

The coconut palm or mnasi ranks next in importance to the clove among the economic resources of Zanzibar. It provides an important native food-stuff; and copra and coconut oil are produced for export. There is a native industry of coir-rope making from the fibre. Palm wine or tembo is obtained by tapping the trees; and those near Zanzibar town are chiefly used for that purpose. This injurious practice does not, however, seem to be so general as on the mainland.

In 1917, the area under coco-nuts in the two islands was estimated at 48,000 acres. They are distributed all over the cultivated regions; and also grow on the coral limestone near the east coast villages. Many have lately been planted at Kokotoni and Chweni. Three distinct varieties are grown. The ordinary Zanzibar palm has light yellowish leaves and fruit. The sea-palm has green flower-spathes and fruit. The Pemba palm is a dwarf form, dark in colour, with small yellow-brown nuts. Only a few of the larger plantations are laid out systematically. In these, about 48 trees to the acre are grown, planted 15 by 20 or 30 ft. apart. Such plantations are valued for sale at £25 to £48 per acre, according to the soil and the proximity of a port. The minimum annual return, for mature palms, is 25s. per acre, and double this if they are well cared for. Most clove properties include a patch of coconuts; but these are generally crowded by the clove trees and so grow up lanky and poor. Many of the native villages are surrounded by palm groves, and there are large areas of undeveloped land suitable for this crop. The Zanzibar palm comes into bearing at 8 years old, and continues fruitful for 60 or 70 years. The normal yield is 120 to 200 nuts a year; but ill-grown trees only give 50 to 100. Picking takes place four times yearly. The Pemba palm comes into bearing at 5 years old, but is chiefly grown for the milk, which in the young nuts is very sweet.

Copra is produced in considerable quantities but most of

it is of an inferior quality to that of Ceylon. Owing to the damp climate, it can seldom be sun-dried sufficiently quickly to escape risk of mould, as this process takes 7 days of hot sunshine. In wet weather it must be smoke-dried over a fire. This takes 2 days, and when done by the small grower blackened and inferior copra generally results. The small traders, who generally employ sun-drying, often expose the copra in dirty places, and sell it half-dried on account of the greater weight. The quality of the natural product is satisfactory; the defects are wholly in the faulty methods of preparation, and copra carefully dried on Government estates ranks with good Malabar.

Thin coir rope is made from coconut fibre by women and girls in the coastal villages. It is then sent to the towns, where it is made into thick ropes for the dhows, which are entirely supplied by the local product. In the past, there were hardly enough palms on the littoral for the needs of this industry, but this is now being remedied.

The following are the copra exports for the past 5 years :

	1913.	1914.	1915.	1916.	1917.
Tons . . .	7,413	8,475	8,585	5,472	6,583
Value (rupees) .	2,559,021	2,434,000	2,048,880	1,652,611	2,992,219

Betel-nut

The betel-nut palm (*Arecha catechu*) grows all over the cultivated area, especially on light soil. It is often planted in small clumps near houses. The nuts, cut in disks, are chewed with the leaves of the betel-vine (*Piper betel*) and regarded by natives as a great delicacy.

Cassava

The cassava or mhogo is the staple food of the natives, and is grown by them in large quantities on both islands. It thrives on rich ground among the cloves and coco-nuts of the west, and will also grow on the coral lime-stone. The plants sometimes attain a height of 6 or 8 ft., producing tubers of 1 ft. long. Two varieties are cultivated: the sweet or Mhogo

Ekundu (*Manihot aipi*) and the bitter or Mhogo Menpe (*M. utilissima*). The sweet cassava can be eaten raw, though usually it is boiled. The acid juice of the bitter kind is poisonous in the raw state. It is generally split and sun-dried and then reduced to flour, of which a porridge is made. The leaves, boiled with scraped coco-nut, are also eaten. Cassava takes 6 months from the time of planting to come to maturity. It is a gross feeder and exhausts the ground. The usual custom is to grow it for two years in the same field, and then allow the land to rest. The whole crop is consumed locally.

Cereals

Most of the cereals for native consumption are now imported, and none are grown on a large scale. Maize or muhindi is also grown in a small way by natives, flourishing in the fertile western district and on the north-eastern limestone. Three kinds of millet are in cultivation: namely mtama or tall millet (*Sorghum vulgare*) in both the red and white varieties, wimbi (*Eleusine coracana*) and club-millet or mwali (*Pennisetum typhoideum*).

Millet is now the chief native cereal; it is used as a mash, or made into cakes. A fermented drink, called pombe, is made from it. It flourishes on the stony coral land to the east, which is now the principal site of native agriculture.

Rice or mpunga is also grown for local consumption but not in sufficient quantities to meet the large demand. Under simple irrigation very large areas could be made available for this crop, which flourishes on the swampy land in the west.

Chillies

The Zanzibar chillies are the hottest in the world. Their pulverized fruit pods yield the cayenne pepper of commerce. The principal varieties are *Capsicum annuum* and *C. frutescens*, which grow almost wild on the eastern coral land. The most pungent chillies—the small ‘bird’s-eye’—are produced by the poorest soil. They were once of economic importance, being

extensively cultivated by the Wahadimu ; but are now decreasing, as the natives who grew them have taken to cloves in their place. It is said that this neglect is partly due to the intense irritation of eyes and skin which is caused by handling them. The exports fell steadily from 500,000 lb. in 1905 to 73,000 lb. in 1913.

Fruits

Many kinds of tropical fruits grow magnificently in the west and are largely used for food ; but no effort is made to develop this great natural resource for trade purposes.

Bananas flourish on the west coast, yielding heavily, as the warm moist clay soil and salt air exactly suit them. They also do well inland especially under the shade of mangoes, and clumps are seen near most villages. There are six varieties in cultivation ; three are eaten as fruit, and three used for flour. The leaves, stalks, and fibres are used for a number of purposes. Bananas may be had ripe at all times of the year, and are perhaps the most important of the secondary food crops.

Fruit trees are mostly confined to the west coast. The most characteristic is the jack fruit (*Artocarpus integrifolia*), a tall tree with milky juice and large egg-shaped leaves. The flesh of the fruit, which has a disagreeable smell, is eaten raw ; the large seeds are roasted. Less common are the bread-fruit (*Artocarpus incisa*), custard-apple (*Anona squamosa*), jambosa (*Eugenia jambolana*), and zimberao (*Eugenia malacensis*).

Pineapples (*Ananas sativas*) are completely naturalized, and grown both for their fruit and for fencing. Citrus fruits—orange, lemon, citron, lime, and shaddock—do well, especially sweet and bitter oranges, which are of the best quality. These are exported to British East Africa, and also sold to steamers calling at Zanzibar. Among other fruits which flourish on rich soil are the cashew-nut (*Anacardium occidentale*) and guava, seen in almost every native garden ; soursop, sweetsop, pomegranate, egg-fruit, rose-apple, litchi, durian (*Durio zibethinus*), and rambutan (*Nephelium lappa-*

ceum). The common fig does well, also the small black Indian mulberry, which often forms hedges between the plantations.

The only fruit trees which are common both to the loam and limestone regions are the pawpaw or melon-tree and the mango. The pawpaw thrives on the stoniest soils. Its fruit is eaten raw, or cooked when unripe, and is a valuable resource to the natives of the eastern districts. The mango, of which several varieties are naturalized, is seen everywhere, mingled with cloves and coco-nuts in the cultivated districts, and also flourish in south-east Zanzibar. It will not grow, however, on the exposed eastern shore. The trees bear heavily twice a year, in January–February and July–August. The fruit of the better varieties is extremely delicate. Both mango and jack are grown for their fruit alone, and little or no use appears to be made of their valuable timber.

Ground-nuts

Both the ground-nut of commerce or Mjugu Nyassa (*Arachis hypogaea*) and the Bambarra ground-nut or earth-pea, Mjugu Mawe (*Voandzeia subterranea*), are grown by the natives ; but more as a delicacy than as a food. A good crop will give as much as 100 bushels an acre, and the nuts yield 50 per cent. of oil.

Oil-seeds

A number of oil-seeds are under cultivation. Sesame or simsim is grown to a limited extent and the oil, which is largely used by the natives, is extracted locally. Six oil-mills for this purpose existed in Zanzibar town in 1913 ; but a large proportion of the seed used is now imported. Coco-nut oil is also extracted from the copra.

The oil-palm (*Elacis guineensis*) or mchikichi grows semi-wild in many parts of Zanzibar. It is cultivated in the Jangwani depression between Chwaka Bay and the Uzi Channel, and in some of the moist valleys of Pemba. The kernels are roasted and eaten by the natives, or steeped in

water and the oil expressed. The average yield of oil is 52 per cent.

The flat circular seed of the cucurbitaceous plant called kweme (*Telfavia pedata*) is also eaten roasted by the natives. The kernels when expressed give from 56 to 64 per cent. of a viscous oil suitable for soap making ; but so far this has not been commercially exploited.

The castor-oil plant (*Ricinus communis*) or mbarika is universally grown in native gardens, and the oil used as an unguent.

Ground-nuts of two kinds are grown (see above) but are mainly used as a native delicacy, and not for oil.

Pulses

These are generally grown by the natives for food ; especially the Congo or pigeon pea (*Cajanus indicus*) or mbazi, and vigna beans (*Vigna catjang*) or koonde. Both are cultivated as field crops. Mbazi, which is abundant, grows well on the coral limestone and is often used for hedges. Both the green pods and ripe seeds are eaten. Other favourite pulses are the fiwe bean (*Dolichos lablab*) and chooko (*Phaseolus Mungo*).

Spices

In addition to cloves, a few spices, mainly nutmeg, vanilla, and cinnamon, are grown in a small way for local consumption and might under favourable conditions be placed upon the market. At present no attention is paid to them.

Cinnamon (*Cinnamomum zeylanicum*) flourishes in dry sandy soil. The trees come into bearing in the fifth year. Nutmeg (*Myristica moschata*) requires a rich moist loam, and does not mature till the seventh or eighth year. Vanilla (*V. planifolia*) is a parasitic climber, which though growing from the ground is mainly an aerial feeder dependent on its tree host. In some of the moist and deeply-shaded Pemba valleys it grows luxuriantly, clambering over the trees in all directions. Its cultivation upon trellises, or in the clove plantations, has been suggested.

Sugar

Sugar cane is generally grown in small patches for household use. The Arabs formerly cultivated it on a large scale at Mwera river and other places, and set up mills for the manufacture of molasses. But this proved unprofitable, and the last factory disappeared in 1897.

Sweet Potatoes

Sweet potatoes (*Ipomoea batatas*) or kiasi are an important native food-crop in the west, but will only grow on rich land. Two varieties are grown: the white or kindoro and red or kuata. The tubers are boiled and eaten with coco-nut. The tops are served as a green vegetable, called mtoriro.

Vegetables

Pumpkins and tomatoes are the favourite native vegetables, and are universally grown by them between the cereal and other crops. Yams are also cultivated, but are less common. The taro (*Colocasia antiquorum*) is grown on swamps and on the banks of streams. Both the leaves and tubers are eaten.

Miscellaneous Products

Among minor food-crops grown by the natives is the arrow-root or uwanga (*Tacca pinnatifida*), which is found in most gardens. A light loam suits it best. The tubers are dried and eaten with sugar. It might profitably be cultivated for export.

Another tuber, the taro (*Colocasia antiquorum*), is grown on swampy ground, often in the shade of bananas. The tubers require long boiling, to remove the poisonous juice. The leaves are a good vegetable.

Among economic plants which might repay further development is the kapok or silk-cotton tree (*Eriodendron anfractuosum*). This is often seen near houses, and is most common on Pemba, where good specimens grow 70 ft. high. The fibre, known as msufi, is in local demand for stuffing pillows and would find a European market. The seeds, which contain about 20 per

cent. of oil, are saleable at Rotterdam. When ginned, 684 lb. of raw fibre yield 360 lb. of 'silk-cotton' and 146 lb. of seed.

Ceara rubber, which was taken up by Government in 1907, has proved a complete failure and its cultivation has ceased. Some wild rubber is gathered, mainly from *Landolphia kirkii*, which grows in the forest of Pemba. It is not important. The exports since 1912 have never reached a ton, and since 1915 have ceased.

Native tobacco is raised for local consumption, and grows on the coral limestone.

LIVE-STOCK

Cattle

Stock-raising is unimportant in Zanzibar and Pemba, and no large herds are kept, as east coast fever is endemic and carries off on an average 50 per cent. of the calves. Should it be found possible to tackle this disease on the scale which has been attempted in British East Africa, the islands might become self-supplying in cattle, as the native stock is fairly good and there is a large area of suitable grazing land on the east side of Pemba.

At present, slaughter cattle are mostly imported from the mainland, and milch cows from India. All cattle on arrival are quarantined at the Pigaduri Cattle Quarantine station, to guard against the introduction of surra and other diseases. Slaughter animals are subject to inspection at the Government abattoir, and all sound meat bears the Government seal.

Dairying is almost wholly in the hands of Indians. Most of the cow-sheds and dairies are in or near Zanzibar town, and from the sanitary point of view leave much to be desired. In 1914 there were 25 such cow-sheds, with 456 cows and 309 calves. The Dairies Decree of 1913 provided for the inspection of milch cows and licensing of dairymen, and gave power to enforce the proper cleansing of all dairies and utensils; but up to 1916 lack of funds had prevented the carrying out of the proposed removal of the cows to new sheds

in the Government stables and closing of the present filthy sheds and dairies, which are a standing menace to the town.

As all the pasture is infected with ticks carrying east coast fever the cows are entirely stall-fed. They are given sliced cassava and simsim cake, with some cotton seed and crushed maize, and 20 lb. of cut grass daily.

The following are the principal imported breeds :

Kathiawar. Large, sturdy animals and deep milkers, giving about 3 gallons a day.

Sind. Rather smaller, giving 2 gallons.

Benadir. Large and lanky, giving 1 gallon a day.

Socotra. Dwarf cattle, good milkers for their size.

The native cattle, which mostly contain some Indian blood, are small and neatly formed with a prominent hump. They make good draught oxen and are used for this purpose in the towns, but are very poor milkers. Grading-up by the importation of Indian bull calves from a good milking strain has been suggested. These, on arrival, should be placed on infected pasture. A few will succumb to fever and the rest will be immune and can be used for breeding when mature.

A rough census of cattle taken in 1914 yielded the following figures :

<i>Zanzibar.</i>	<i>Total.</i>	<i>Pemba.</i>	<i>Total.</i>
Zanzibar town . . .	552	Weti district . . .	2,821
Mwera district . . .	1,625	Chake-Chake district . . .	2,134
Mkokotoni district . . .	1,019	Mkoani district . . .	1,579
Chwaka . . .	1,345		
	<hr/> 4,541		<hr/> 6,534

Sheep and Goats

There are no indigenous sheep. A number are imported for slaughter from the Benadir coast. Large herds of goats are kept, and their milk is an important article of food, but the native breed is small and has a poor yield. In Zanzibar town two breeds of Indian long-eared goats are kept, which are good milkers. Numbers of goats are imported from British and Tanganyika Territory, Benadir, and the Comoro Islands,

In general the goats are free from disease, but on Tumbatu Island a disease occurs marked by lesions of the hoof and jaw. Among those imported from the mainland there is a high mortality from pleuro-pneumonia.

Other Animals

Not many horses are kept, though they are imported—chiefly for the royal stables—from India, Arabia, and the Cape. There is also an import of ponies from Abyssinia and Somaliland. Stables must be mosquito-proof if the animals are to be kept in health. Donkeys, which are preferred to mules, are much used for riding into the interior, but little for transport. A strain of pure Muskat donkeys exists in Zanzibar, but the damp coastal climate does not suit them. When crossed with the grey Masai breed they produce a useful and hardy animal much in request. All donkeys, however, are much subject to disease.

A small herd of Indian buffaloes is kept by Government. These are useful draught animals and worth encouraging, especially in view of the possible introduction of ploughing. The cows are prolific milkers and their milk is very rich in fat. Unfortunately they appear to be susceptible to east coast fever.

TABLE OF IMPORTS AND SLAUGHTER OF LIVE-STOCK¹

	1913.		1914.	
	<i>Imported.</i>	<i>Slaughtered.</i>	<i>Imported.</i>	<i>Slaughtered.</i>
Bullocks . . .	2,300	1,985	1,865	1,437
Cows . . .	178	—	—	—
Sheep . . .	4,817	1,124	—	1,871
Goats . . .	6,337	12,862	9,365	9,336
Donkey . . .	20	—	1	—

FISHERIES

Fish, which is plentiful all round the coasts, is a staple native food; and fisheries exist at most of the villages on the shore.

¹ This applies only to animals inspected for slaughter at the Government abattoir. There are a few small private slaughter-houses.

The surplus catch is smoked and dried and sent to Zanzibar, the inland villages, and the mainland. There is a large demand in Zanzibar town and Dar es-Salaam. Fishing is mostly done with the hook and line. Nets are only used near shore, and inside the reefs. Fishing-traps, consisting of large baskets, are also employed, and many villages erect fishing-stakes, which last for six or eight months. The standard fishing-boat is the *galawa* or native dug-out, with outriggers. This goes out on one rising tide and returns on the next. Owing to the heavy surf, fishermen from the north coasts of the island generally migrate south with their *galawas* during the north-east monsoon, and during the south-west monsoon a return movement to the north takes place.

Zanzibar town is the centre of the fishing industry. About 4,000 boats work from it. Of recent years a class of fishermen from Diu in Portuguese India have settled there, with their own dug-outs. They are exceedingly industrious and are fast cutting out the indolent natives. The edible catch includes shark, turtle, crayfish, crabs, and prawns, and the following marine fishes : dagaa ya papa, dagaa ya kichwa, vikua, chafi, koli-koli (bayardo), mkizi (mullet), nguru (king-fish), jodali changu, songoro, chumbururu, chewa, kikande, tassi, and gissi.

ANIMAL PRODUCTS

Hides and Skins

There is a small export of locally produced hides and skins. In 1914, 862 cwt., valued at £3,972, left Zanzibar ; but export fell during the war, and in 1916 amounted only to 182 cwt., valued at £469.

Beeswax

This is a staple product, ranking with Madagascar and Mozambique wax. The following are the latest export figures :

	1913.	1914.	1915.	1916.
<i>Cwt.</i>	18	18	83	18
<i>Value</i>	£114	£116	£441	£95

Cowries and other Shells

The trade in these appears to be decreasing rapidly, and fell from 1,571 packages valued at £1,941 in 1913 to 51 packages valued at £291 in 1916. There is no information as to the economic value of the mother-of-pearl oysters, extensive beds of which exist off the east coast of Zanzibar. Tortoise-shell is obtained, and in some years a small quantity is exported.

MINERALS

The only mineral wealth appears to be building-stone. Of this, there are 58 quarries—30 on Government property and 28 on private land. In 1916, 14 quarries were being worked by Government, 5 being on private property and the rest state-owned. The most important is the Zanzibar Town Quarry. From this, 135,616 cubic feet of stone, value £425, were taken in 1914; 115,545, value £770, in 1915; and 186,897, value £996, in 1916.

TRADE STATISTICS

				<i>Imports.</i>	<i>Exports.</i>
				£	£
1910	.	.	.	993,031	1,033,467
1911	.	.	.	1,179,699	1,193,137
1912	.	.	.	1,030,996	1,036,127
1913	.	.	.	1,103,347	1,048,866
1914	.	.	.	763,405	814,952
1915	.	.	.	803,877	791,016
1916	.	.	.	1,259,820	1,052,167
1917	.	.	.	1,760,094	1,848,792

SHIPPING (Ocean-going)

				<i>No.</i>	<i>Gross tonnage.</i>
1910	.	.	.	5,025	1,087,004
1911	.	.	.	5,325	1,288,012
1912	.	.	.	4,942	1,395,856
1913	.	.	.	5,148	1,502,920
1914	.	.	.	3,779	1,121,905
1915	.	.	.	—	545,971
1916	.	.	.	108	439,735
1917	.	.	.	76	351,844

CHAPTER IV

HISTORY

FOR the earlier history of Zanzibar see section on the East Africa Protectorate, Part I, chap. XIV. The term 'Zanzibar', meaning 'the country of the blacks', originally included the neighbouring coast region of the mainland, but its use is now restricted to the town, the island, and the protectorate of Zanzibar, which includes the island of Pemba as well as that of Zanzibar.

Although American whaling vessels began to touch at the town towards the close of the eighteenth century, it remained of secondary importance until about 1840. Between 1832 and 1840 Seyyid Said, the ruler of Muskat, made it his permanent residence and the centre of his sea-power, for which it was suited by its position and its admirable harbour. Before his death in 1856 the town had become a very important centre of trade. He also encouraged the cultivation of cloves. These quickly became the principal products of Zanzibar and Pemba and still remain so. The United States established a consulate there in 1836, the French in 1844, and the Hanseatic League in 1859.

In 1861 after Said's death, his dominions were divided between his two sons, and Zanzibar became politically independent of Muskat. In 1862 the independence of the sultan was recognized by England and France. The opening of the Suez Canal in 1869 brought East Africa into closer connexion with Europe, and in 1872 the British India Steam Navigation Company began a regular service between Zanzibar and Aden. This step was due to the attitude of Seyyid Bargash, who became sultan in 1870 and showed himself most friendly to England. Under the influence of Sir John Kirk

the British consul-general from 1866 to 1887, he pursued a line of policy which consolidated his power over the neighbouring parts of the continent and led to a great increase of commerce at the coast ports. By the expansion of trade with the interior he also extended his influence as far as the countries round the great lakes.

After his death the power of the sultan underwent a rapid decline. Between 1887 and 1890 all his continental possessions were leased to one or other of the three great powers, England, Germany, and Italy. Germany and Italy subsequently purchased outright the territory leased to them, Germany in 1890 and Italy in 1905. On June 14, 1890, the sultan agreed to the establishment of a British Protectorate, which should include the islands of Zanzibar and Pemba, the only parts of his territory which he still retained under his direct control. This Protectorate was recognized by Germany in July 1890 and by France in August 1890, in return for the recognition by England of the French protectorate over Madagascar.

The Government of Zanzibar.—When England assumed the Protectorate there was no organized system of administration in existence at Zanzibar, and the Government was described by Sir Gerald Portal as ‘an embodiment of all the worst and most barbarous characteristics of a primitive Arab despotism’. The British agent and consul-general represented the English Government, and more particularly the Foreign Office, in whose charge the Protectorate was placed. In 1891 a government was formed with Sir Lloyd Mathews, a retired naval officer, as prime minister, and with responsible officers, who could only be removed with the approval of the consul-general, in charge of the principal departments of State. A civil list of 120,000 rupees was assigned to the sultan and the remainder of the revenue passed under the control of the Government. For some time after the establishment of the British East Africa Protectorate in 1895 the agent and consul-general held also the office of commissioner for British East Africa, where he usually resided. He was

represented at Zanzibar by the British resident. But in 1904 it was considered advisable to place Zanzibar and British East Africa under separate officials, and in 1906 the administration was reorganized and brought more under the control of the protecting power. The prime minister was given two colleagues—a financial minister and an attorney-general. These three officers sent in reports to the agent and consul-general, and no important step was taken, either in internal or external affairs, without the approval of the British foreign secretary. In 1907 the sultan's army was disbanded and two companies of the King's African Rifles stationed at Zanzibar.

In April 1914 the Protectorate was transferred from the Foreign to the Colonial Office, and the administration was placed under a high commissioner. This office was filled by Sir H. C. Belfield, who was already governor of British East Africa, and thus after ten years the two protectorates were reunited under the same head. It was also felt that the division of control resulting from vesting the sultan's authority in a prime minister was disadvantageous. In consequence the duties hitherto discharged by the agent and consul-general and the prime minister were transferred to the British resident, who thus became the agent both of the English Government and of the sultan and was empowered to deal with all questions of administration, subject to the general supervision of the high commissioner and the colonial secretary. A protectorate council was also instituted with the sultan as president. It included the resident, the chief secretary, the treasurer, and the attorney-general, together with three unofficial members. It is an advisory body without legislative powers.

The Bombardment of the Palace.—The change in the spirit of the Government under the British Protectorate and the reforms of the British authorities, particularly their intolerance of slave trading, produced considerable dissatisfaction among the Arab population, but only one serious attempt was made to return to the old order of things. The most prominent member of the Anti-British party was a son of Seyyid Bargash,

named Khalid, who resented strongly the prohibition of slave-trading and desired to bring about a reaction. He twice attempted to make himself sultan. On the first occasion after the death of Seyyid Ali in 1893 he was easily prevented by Sir Lloyd Mathews, and his cousin Hamid bin Thuain was appointed Seyyid Ali's successor. In August 1896, however, Seyyid Hamid died. It was generally believed in Zanzibar that he was poisoned and that Khalid expected his death. He immediately seized the palace and was proclaimed sultan. The reactionary Arabs rallied to his support, and he quickly found himself at the head of a considerable force. Several English warships happened to be in the harbour, and on his refusal to surrender the palace was bombarded on August 27 and reduced to ruins. Khalid took refuge in the German consulate, whence in spite of the protest of the English representative he was conveyed to German East Africa in a German warship as a political refugee. But the rising came to an end with his flight, and his relative Hamid bin Hamoud was proclaimed sultan without opposition. The failure of Khalid's attempt had undoubtedly great political effect in destroying all hope of return to former conditions and thus made the task of the British administration easier.

Trade and Commerce.—In November 1886 Seyyid Bargash, when acceding to the general provisions of Berlin Act of 1885, excepted his territory from the free-trade articles of that Act, and he therefore continued to levy an *ad valorem* duty of five per cent. on all imports besides imposing export duties of various amounts. When the British Government assumed the Protectorate it was led by trade considerations to adopt a free-trade policy for the port of Zanzibar. For fifty years Zanzibar had been the centre of East African trade, but this position was due to conditions that were passing away. While slave raiding was unchecked, property was safer in Zanzibar than in any part of the mainland; and for this reason many European firms settled there. At a later time Zanzibar enjoyed direct steamship communication with Europe and

India, and from 1879 it was connected with the outer world by cable.

But after the establishment of English and German influence on the mainland property became secure, and therefore the supremacy of Zanzibar was less assured. The necessity for transshipment between Zanzibar and the mainland increased the cost of goods ; and there were excellent harbours on the mainland, superior to that of Zanzibar for ships of large tonnage. The greater part of the Zanzibar transit trade was with German East Africa. This was due not only to the geographical position of Zanzibar, but also to the fact that 'the German road', as the route through German territory to the southern shore of Victoria Nyanza came to be called, was the most practicable route to the interior, and therefore was by far the most considerable avenue of trade. The Germans, however, soon took steps to become commercially independent of Zanzibar. In 1890 they established a direct steamship service from Hamburg to Dar-es-Salaam and Tanga, and in 1892 direct shipping communication with India. In September 1890 also the cable was extended from Zanzibar to Bagamoyo.

The British Government watched attentively the development of the young German colony. It realized the danger that Zanzibar would lose control of East African trade ; and in order to meet the new situation it declared Zanzibar a free port in February 1892.

But this measure proved unavailing. Other causes, some permanent, such as the establishment of different monetary standards in 1903, others temporary, like the outbreak of plague in Zanzibar in September 1905, contributed to direct German trade still further, until in July 1897 the Deutsche Ostafrika Linie, the chief German shipping line, removed its head-quarters from Zanzibar to Dar-es-Salaam at the requirement of the German Government. It was evident that the object for which Zanzibar had been made a free port, the maintenance of general trade control, was unattainable. Moreover, after the establishment of the British East Africa

Protectorate and the commencement of the Uganda Railway in 1895, it appeared that the importance of the 'German road' might be considerably diminished by the development of the British route from Mombasa to the west shore of Victoria Nyanza. In such a case Mombasa might assume somewhat the position with regard to East African trade formerly held by Zanzibar. As a result of these and other considerations the free port policy was abandoned and in 1899 a general import duty of 5 per cent. *ad valorem* was reimposed, which in January 1908 was raised to $7\frac{1}{2}$ per cent. The rate of duty at the continental ports was 10 per cent. and it was considered desirable to restrict that at Zanzibar to a lower figure.

After 1899 Mombasa rapidly acquired control of British East Africa trade as Dar-es-Salaam had already done with regard to German East Africa. After 1899 the intermediate steamers of the Deutsche Ostafrika Linie touched at the port; in July 1900 the Austrian Lloyd from Trieste commenced running; and in July the steamers of the British India Steam Navigation Company began calling every month. In 1903 the completion of the Uganda Railway and the establishment of a regular shipping service on Victoria Nyanza gave Mombasa unquestioned supremacy. From 1903 the Deutsche Ostafrika Linie sent their main steamers to call regularly at Kilindini, and in January 1905 the Messageries Maritimes began to call at Mombasa. The economic independence of Mombasa was reflected in the political separation of Zanzibar and Mombasa in 1904, when the consul-general of Zanzibar ceased to be high commissioner of the East Africa Protectorate. When the two protectorates were re-united in 1914 the relative importance of the two ports was inverted. But notwithstanding the growth of Mombasa as an ocean port, Zanzibar has continued prosperous and appears likely to retain control of local traffic, so long at any rate as the customs rates there are lower than those levied at the continental ports.

Measures against Slavery and the Slave Trade.—The abolition

of slavery in the islands of Zanzibar and Pemba has been the most important achievement of the British Government since it acquired political influence there. The earliest measures were directed against the slave trade, of which Zanzibar was the principal centre on the east coast.

In 1873 Seyyid Bargash concluded a treaty with England by which he undertook that the export of slaves from the coast of the mainland of Africa, whether destined for transport from one part of his dominions to another or for conveyance to foreign parts, should entirely cease. He also promised that all public markets in his dominions for the buying and selling of imported slaves should be closed. This treaty, however, was very imperfectly carried out. In 1896 the British vice-consul at Pemba asserted that no serious attempts had been made to enforce the provisions against slave dealing and that it had remained practically a dead letter so far as Pemba was concerned. The restriction of the slave trade with the continent was the result of the English and German occupation of the sea-ports from which the slaves had been shipped and also in some degree of the activity of the British navy and of the measures provided by the Brussels Act of 1890.

The actual abolition of slavery within the dominions of the Sultan of Zanzibar was a difficult matter. Slavery formed an integral part of the social system. The institution was recognized by Mohammedan law and was generally approved by public feeling. Any attempt to suppress it suddenly would have met with widespread reprobation and possibly with resistance, and would not have been appreciated by the slaves themselves, who were accustomed to their condition and fairly contented. The slave's lot was considerably ameliorated, as a rule, by his being regarded as a regular member of the household, though this did not prevent his being oppressed by a master of harsh or avaricious disposition. Immediate abolition would not only have inconvenienced the owner by breaking up the only form of household to which he was accustomed, but would have left a number of

aged and infirm slaves without any provision. Its economic consequences would have been very disastrous, for the slaves supplied the greater part of both skilled and unskilled labour. They also formed the larger part of the total population. About 1856 it was estimated that the population of Zanzibar and Pemba amounted to 400,000 persons and that of these two-thirds were slaves. These figures have no claim to exact accuracy, though subsequent investigators have frequently accepted them as forming a reasonable basis for calculation, and it is probable that they overstated the slave population. In 1897, when emancipation seriously began, the number of slaves was about 100,000. For some time previously it had been decreasing rapidly owing to a high death-rate, a low birth-rate, and restrictions on importation. But even if earlier estimates exaggerated the slave population, it was evident that the question was one requiring cautious handling. In 1895 the general opinion among the missionaries labouring in the two islands was that immediate emancipation would be disastrous to the slaves themselves as well as to their owners. On the other hand the missionaries in Uganda urged with some force that the continued existence of slavery in Zanzibar created a demand for slaves in the interior districts of Africa.

In September 1889 Sir Gerald Portal made a beginning by obtaining a proclamation from Seyyid Khalifa decreeing that all slaves brought into the Zanzibar dominions after November 1, 1889, should be free. He also concluded an agreement with him in the same month that all children born in his dominions after January 1, 1890, should be free. But this agreement was never promulgated in the islands at all and therefore remained a dead letter. In August 1890 Seyyid Khalifa's successor Seyyid Ali published a decree of considerable importance. In the first place it forbade absolutely all traffic in slaves and directed that any houses kept for such a purpose should be closed. It is very doubtful whether this injunction had much effect. In the next place it declared that on the death of a slave owner the slaves might be inherited

only by his lawful children, and that if he left none his slaves should become, *ipso facto*, free. The principle thus laid down became firmly established and was generally enforced. Lastly there was an article which gave any slave the right to purchase his freedom for a reasonable sum. But this article had to be virtually repealed a few weeks later as it was feared that its enforcement would endanger the life of the sultan.

In 1894, after an appeal from the British and Foreign Anti-Slavery Society, Lord Salisbury wrote to Sir Arthur Hardinge, the consul-general, calling attention to the feeling in England against the maintenance of slavery and urging that more effective steps should be taken for its abolition. In April 1897 in consequence Seyyid Hamoud published a decree abolishing the legal status of slavery. Among other reasons for this action given in the decree it was stated that the decreasing number of slaves rendered slave labour insufficient, while its existence deterred free labourers from coming to the islands. The decree enabled any slave to obtain his liberty by claiming it before a court of law, while, in cases where the slaves were lawfully held, the owner was to be given compensation by the State, the amount to be determined by the court. Although the greater part of the slave population did not seek immediate emancipation, this decree produced an entire change in their condition. It discouraged harsh or unjust treatment on the part of an owner by enabling his slaves to claim emancipation as a remedy. It effectively put an end to any further importation of slaves into Zanzibar and Pemba. It also enabled the English administrators to introduce in 1898 the practice of paying labourers, whether free or slave, employed in gathering the clove harvest, the principal crop of the two islands. The payment of labour was found to be so much more productive, that the practice was in a short time universally adopted and extended to other forms of employment. Although some of the emancipated slaves refused to work regularly, there was a marked general improvement in the

quality of the work both of the emancipated slaves and of those who refused to claim their freedom, but who now received pay. Slavery soon ceased to exist except in name, although in 1901 it was estimated that 50,000 persons still remained in the two islands who had not claimed their freedom. The most serious detrimental effect of emancipation was an immense increase in prostitution among the female freed slaves, due to their liberation from the tutelage of the Arab household.

In June 1909 the process of emancipation was completed by a supplementary decree, which directed that compensation should be given to any former slave, unable to support himself, for the deprivation of his master's protection. At the same time the close of the year 1911 was fixed as the period after which no claims for compensation from either master or former slave should be entertained by the State.

APPENDIX A

ADMINISTRATIVE DIVISIONS AND POPULATION (1917-1918)

<i>Province.</i>	<i>District or sub district.</i>	<i>Euro- peans.</i>	<i>Indians.</i>	<i>Goans.</i>	<i>Arabs.</i>	<i>Others.</i>	<i>Natives.</i>
Nyanza	Kisumu	382	1,861	138	68	15	1,055,968
	North Kavirondo						
	South Kavirondo						
	Nandi						
Naivasha ¹	Lumbwa	1,656	508	123	23	11	87,637
	Naivasha						
	Nakuru						
	Ravine						
	Maraquet						
	Baringo						
	Turkana						
Kenya	Uasin Gishu	301	322	47	5	—	776,905
	Elgeyo						
	Nyeti						
	Fort Hall						
	Embu						
Ukamba	Meru	2,614	5,981	1,189	47	—	358,439
	Nairobi						
	Kikuyu						
	Machakos						
Seyidie	Kitui	333	4,851	540	4,239	23	166,372
	Mombasa						
	Malindi						
	Teita						
Tanaland	Vanga	13	726	34	,954	6	38,336
	Lamu						
	Tana River						
Jubaland	Sultanate of Witui	25	343	21	1,014	2	9,648
	Kismayu						
	Gosha						
Northern Frontier District	Serenli	20	6	5	5	—	89,646
	Masai Reserve ²						
		18	95	29	3	12	39,043
		5,362 ³	14,693	2,126	7,358	69	2,622,164

¹ Turkana and Masai figures not included.

² Included in the administrative division of Naivasha Province.

³ Since these figures were compiled over 1,000 ex-soldiers have been granted land in the colony.

The European population was constituted as follows :

Adult males	2,357
„ females	1,529
Children	1,476

Of the adult males 2,096 were British.

The European male population is sub-divided, according to occupation, as follows :

Government officials	641
Planters and farmers	1,011
Commercial	473
Missionaries	126
Professional men	57
Unclassified	49

APPENDIX B

CLIMATE TABLES

SUMMARY

TABLE	PAGE
I. Mean Temperature	584
II. Mean Daily Maximum Temperature.	586
III. Mean Daily Minimum Temperature.	588
IV. Mean Monthly Maximum Temperature	590
V. Mean Monthly Minimum Temperature	592
VI. Range of Temperature	594
VII. Absolute Maximum Temperature	596
VIII. Absolute Minimum Temperature	598
IX. Mean Rainfall	600
X. Maximum Rainfall in Month and Year	602
XI. Minimum Rainfall in Month and Year	604
XII. Maximum Rainfall in 24 hours	606
XIII. Mean Number of Rain Days	608
XIV. Cloud	610
XV. Relative Humidity	612
XVI. Mean Number of Days of Hail	612
XVII. Mean Number of Hours of Sunshine	614
XVIII. Mean Number of Thunderstorms	614
XIX. Mean Wind Force (0-10)	616
XX. Wind Directions. Percentage of Observations	618
XXI. Seasonal Winds at Hours of Observation	630
(a) Entebbe	630
(b) Bukoba	631
(c) Rubja	632
(d) Muansa	633
(e) Moshi ,	634
(f) Amani	635
XXII. Winds of Strength 4-12, Beaufort Scale, at Entebbe. Per 100 observations at each of the hours, 7, 14, and 21	636
XXIII. Latitude, Longitude, and Altitudes of stations	640

TABLE I

MEAN TEMPERATURE

	Jan. ° F.	Feb. ° F.	Mar. ° F.	April. ° F.	May. ° F.	June. ° F.
Victoria Nyanza District, 1° N.-3° S. 32° E.-35° E. :						
Mengo	69.4	70.0	71.2	70.6	69.2	66.7
Entebbe	71.9	72.1	71.8	70.6	70.5	69.9
Kisumu or Port Florence	74.7	74.4	75.6	73.7	73.8	72.4
Shirati	74.8	76.1	74.3	72.9	72.1	72.9
Bukoba	69.4	69.8	70.5	69.8	69.3	69.1
Rubja (Bukoba)	67.0	66.9	67.2	65.7	65.7	65.8
Neuwied (Ukerewe)	72.9	73.0	73.8	71.6	72.1	72.1
Muansa	71.6	72.3	72.0	71.4	72.0	71.4
Equatorial Plateau, 1° N.-1½° S. 35° E.-38° E. :						
Nandi	67.0	66.8	66.9	65.4	65.2	64.7
Eldama Ravine	60.9	61.4	62.0	62.2	61.2	60.3
Naivasha	64.8	64.7	63.8	62.7	63.3	61.4
Fort Hall	66.0	67.6	69.4	68.0	66.4	63.9
Sotik	64.0	65.0	65.5	65.6	65.6	64.7
Limoru	62.1	62.2	61.9	59.5	58.1	56.4
Kikuyu	62.1	63.5	63.3	63.0	60.6	58.2
Nairobi	63.8	64.8	65.8	65.6	63.6	61.6
Machakos	65.6	68.2	67.4	66.5	63.8	60.5
South Frontier, 3° S.-5° S. 36° E.-39° E. :						
Moshi	72.9	74.3	72.9	68.4	66.2	64.4
Arusha	70.2	71.6	70.7	68.7	65.1	62.8
Voi, Taita (2 yrs.)	77.2	78.8	77.8	76.9	77.6	77.1
Mwatate (2 yrs.)	73.5	73.6	75.0	74.7	70.2	68.8
Amani	70.5	71.4	71.4	69.1	66.9	64.9
Coast, 0°-6° S. 39° E.-43½° E. :						
Kismayu	82.6	82.6	84.0	84.9	81.8	79.3
Lamu	80.7	81.6	82.1	81.3	79.8	79.0
Malindi (2 yrs.)	81.1	81.5	83.7	83.1	80.6	78.9
Mombasa	81.0	81.0	82.0	81.0	79.0	77.0
Tanga	81.7	81.8	81.8	79.7	77.4	76.3
Pemba	79.1	79.0	79.4	77.2	75.0	74.4
Zanzibar	82.8	83.4	83.0	80.8	79.0	77.9

July. ° F.	Aug. ° F.	Sept. ° F.	Oct. ° F.	Nov. ° F.	Dec. ° F.	Year. ° F.
---------------	--------------	---------------	--------------	--------------	--------------	---------------

**Victoria Nyanza District,
1° N.-3° S. 32° E.-35° E. :**

65.6	66.2	67.1	67.3	67.5	68.2	68.2	Mengo.
68.8	69.2	70.5	71.2	71.0	71.0	70.7	Entebbe.
72.2	72.4	73.5	74.7	74.1	74.1	73.9	Kisumu or Port Florence.
71.6	72.5	73.9	72.9	73.1	73.9	73.4	Shirati.
68.2	68.0	69.3	69.3	69.3	68.9	69.2	Bukoba.
65.3	65.3	66.1	66.6	65.7	65.8	66.0	Rubja (Bukoba).
71.6	72.0	73.6	74.1	73.0	72.1	72.7	Neuwied (Ukerewe).
71.2	71.6	73.4	73.6	72.3	71.4	72.0	Muansa.

**Equatorial Plateau, 1° N.-1½° S.
35° E.-38° E. :**

63.1	62.7	63.1	64.2	63.7	63.6	64.7	Nandi.
58.9	58.7	59.4	59.4	59.0	58.5	60.2	Eldama Ravine.
60.5	61.5	62.1	62.1	63.6	63.0	62.8	Naiyasha.
62.7	63.5	67.2	69.2	67.2	67.2	66.7	Fort Hall.
63.4	64.8	66.2	65.2	63.0	63.9	64.7	Sotik.
54.6	54.9	58.3	61.2	60.0	60.1	59.4	Limoru.
56.4	57.8	60.7	62.9	61.2	62.2	61.1	Kikuyu.
59.4	60.4	63.0	65.3	64.0	63.0	63.3	Nairobi.
59.0	60.1	62.9	65.6	64.6	63.2	64.0	Machakos.

**South Frontier, 3° S.-5° S.
36° E.-39° E. :**

63.5	64.0	66.4	69.4	70.7	71.4	68.7	Moshi.
61.9	63.3	66.4	69.6	69.6	69.8	67.5	Arusha.
73.5	72.1	75.0	77.1	78.5	78.2	76.6	Voi, Taita (2 yrs.).
67.2	68.6	70.3	73.1	73.2	71.6	71.6	Mwatate (2 yrs.).
63.1	63.5	64.4	66.7	68.4	70.5	68.2	Amani.

Coast, 0°-6° S. 39° E.-43½° E. :

78.4	78.4	79.5	81.2	82.8	83.1	81.6	Kismayu.
77.9	78.1	79.3	79.8	81.1	82.2	80.2	Lamu.
77.5	77.7	80.0	81.8	82.5	82.1	80.9	Malindi (2 yrs.).
76.0	76.0	78.0	79.0	80.0	81.0	79.0	Mombasa.
74.4	74.4	75.3	77.3	79.3	81.2	78.4	Tanga.
73.2	73.4	74.6	76.5	77.6	78.9	76.5	Pemba.
76.7	76.9	77.9	79.3	80.7	82.4	80.1	Zanzibar.

TABLE II

MEAN DAILY MAXIMUM TEMPERATURE

	Jan. ° F.	Feb. ° F.	Mar. ° F.	April. ° F.	May. ° F.	June. ° F.
Victoria Nyanza District,						
1° N.-3° S. 32° E.-35° E. :						
Entebbe	80.0	80.2	79.2	77.3	76.9	76.7
Kisumu or Port Florence.	86.0	85.3	86.2	82.3	83.1	82.3
Shirati	86.5	88.9	85.8	83.5	83.3	83.8
Bukoba	78.8	78.6	78.8	77.0	76.8	77.7
Rubja (Bukoba)	76.6	76.1	75.9	73.8	73.9	74.6
Neuwied (Ukerewe).	81.3	81.5	82.4	79.2	80.2	81.3
Muansa	84.6	85.5	84.0	82.8	83.8	84.0
Equatorial Plateau, 1° N.-1½° S.						
35° E.-38° E. :						
Nandi	79.6	79.3	78.9	76.7	77.3	76.2
Eldama Ravine	76.1	76.2	76.4	75.7	74.5	74.0
Naivasha	81.1	82.2	79.5	78.3	75.6	76.2
Fort Hall	80.7	82.3	84.1	80.0	77.9	75.4
Sotik	85.7	84.0	82.1	78.7	78.3	77.3
Limoru	75.4	74.6	73.7	68.9	66.4	64.5
Kikuyu	67.0	72.5	73.5	71.6	67.0	66.6
Nairobi	76.6	78.3	78.4	74.9	72.2	71.8
Machakos	78.3	80.5	80.6	77.5	74.5	72.9
South Frontier, 3° S.-5° S.						
36° E.-39° E. :						
Moshi	84.4	86.2	83.5	77.2	73.8	72.0
Arusha	84.2	84.9	84.6	79.2	73.2	71.6
Voi, Taita	87.0	88.7	87.8	86.5	87.5	88.4
Mwatate (2 yrs.)	83.7	85.3	88.7	85.4	78.0	78.7
Amani	79.9	81.9	82.0	76.8	74.5	72.5
Coast, 0°-6° S. 39° E.-43½° E. :						
Lamu	85.8	86.8	87.0	86.5	86.5	86.5
Malindi	—	—	—	88.0	85.0	84.0
Mombasa	85.0	86.0	87.0	85.0	83.0	81.0
Tanga	87.7	87.8	88.5	85.6	82.9	82.7
Pemba	84.8	85.2	85.4	82.4	79.6	79.6
Zanzibar	86.1	86.9	86.7	84.4	82.5	81.7

<i>July.</i> ° F.	<i>Aug.</i> ° F.	<i>Sept.</i> ° F.	<i>Oct.</i> ° F.	<i>Nov.</i> ° F.	<i>Dec.</i> ° F.	<i>Year.</i> ° F.
----------------------	---------------------	----------------------	---------------------	---------------------	---------------------	----------------------

**Victoria Nyanza District,
1° N.-3° S. 32° E.-35° E. :**

76.1	77.0	78.8	79.9	79.1	79.0	78.5	Entebbe.
82.5	83.3	84.8	86.2	83.7	84.8	84.2	Kisumu or Port Florence.
82.0	82.8	84.9	83.7	83.7	84.9	84.5	Shirati.
77.4	77.0	78.8	79.5	79.0	78.3	78.1	Bukoba.
73.8	73.6	74.9	74.8	75.0	75.4	74.8	Rubja (Bukoba).
81.3	81.3	82.9	83.3	81.3	80.2	81.3	Neuwied (Ukerewe).
84.2	84.6	86.2	86.2	84.6	83.5	84.5	Muansa.

**Equatorial Plateau, 1° N.-1½° S.
35° E.-38° E. :**

73.8	71.2	74.7	76.6	75.6	75.9	76.3	Nandi.
71.6	72.1	74.5	75.8	73.0	73.9	74.6	Eldama Ravine.
74.1	75.9	77.8	76.9	79.4	77.7	77.5	Naivasha.
74.0	75.3	80.2	81.9	78.1	79.4	79.2	Fort Hall.
77.9	78.1	81.6	83.1	78.7	82.1	80.7	Sotik.
63.0	62.8	69.1	72.6	68.6	70.7	69.2	Limoru.
64.8	67.6	70.9	73.5	69.5	69.8	69.6	Kikuyu.
69.3	70.5	75.1	77.3	72.9	72.7	74.2	Nairobi.
71.7	72.4	77.7	80.4	75.9	74.8	76.4	Machakos.

**South Frontier, 3° S.-5° S.
36° E.-39° E. :**

71.4	73.0	75.9	81.3	82.6	82.8	78.8	Moshi.
71.6	73.8	77.5	82.6	83.8	83.7	79.2	Arusha.
84.3	81.6	85.3	88.0	89.0	88.0	88.8	Voi, Taita.
76.0	78.6	81.5	85.6	86.0	84.7	82.7	Mwatate (2 yrs.).
71.4	72.3	74.1	77.0	77.9	80.1	76.7	Amani.

Coast, 0°-6° S. 39° E.-43½° E. :

84.8	84.5	84.5	85.0	86.0	87.8	86.2	Lamu.
82.0	81.0	83.0	84.0	85.0	84.0	—	Malindi.
80.0	80.0	82.0	83.0	84.0	85.0	83.0	Mombasa.
80.7	80.7	81.8	84.6	85.6	87.6	84.7	Tanga.
78.4	79.1	80.9	83.2	83.5	84.7	82.2	Pemba.
80.6	81.1	82.3	83.4	84.2	85.7	83.8	Zanzibar.

TABLE III.

MEAN DAILY MINIMUM TEMPERATURE

	<i>Jan.</i> ° F.	<i>Feb.</i> ° F.	<i>Mar.</i> ° F.	<i>April.</i> ° F.	<i>May.</i> ° F.	<i>June.</i> ° F.
Victoria Nyanza District, 1° N.-3° S. 32° E.-35° E. :						
Entebbe	63.8	63.9	64.4	63.8	64.0	63.1
Kisumu or Port Florence.	63.6	64.2	65.0	65.3	64.6	62.6
Shirati	63.1	63.5	62.8	62.4	61.0	61.7
Bukoba	61.9	62.2	62.6	63.1	63.1	62.2
Rubja (Bukoba)	60.8	60.7	61.0	60.4	60.4	60.1
Neuwied (Ukerewe)	64.4	64.6	65.1	64.2	64.0	63.1
Muansa	61.2	61.5	61.7	61.2	61.2	58.6
Equatorial Plateau, 1° N.-1½° S. 35° E.-38° E. :						
Nandi	54.3	54.3	55.1	54.2	53.1	53.1
Eldama Ravine	46.0	46.6	46.8	48.7	47.2	46.7
Naivasha	48.4	47.4	48.0	48.6	48.7	45.9
Fort Hall	51.2	52.9	54.6	55.7	55.0	52.4
Sotik	42.2	46.0	48.9	52.5	52.8	52.0
Limoru	48.8	49.8	51.2	52.8	52.0	48.5
Kikuyu	53.2	53.0	53.6	54.5	52.8	50.0
Nairobi	51.0	51.3	53.3	56.3	55.0	51.5
Machakos	52.9	56.0	54.2	55.5	53.2	48.2
South Frontier, 3° S.-5° S. 36° E.-39° E. :						
Moshi	63.5	64.0	64.4	62.6	61.3	59.2
Arusha	56.5	58.8	59.2	60.4	59.0	55.8
Voi, Taita	67.4	69.0	67.7	67.3	67.7	65.9
Mwatate	63.2	62.0	61.4	64.2	62.3	59.0
Amani	63.9	63.3	63.5	62.2	61.5	59.2
Coast, 0°-6° S. 39° E.-43½° E. :						
Lamu	75.3	76.5	77.2	75.6	74.0	70.5
Malindi	—	—	—	82.0	78.0	77.0
Mombasa	76.0	77.0	77.0	77.0	75.0	73.0
Tanga	75.8	75.8	75.1	73.9	72.0	69.9
Pemba	73.4	72.9	73.5	72.0	70.5	69.1
Zanzibar	79.4	79.9	79.4	77.3	75.6	74.1

July. ° F.	Aug. ° F.	Sept. ° F.	Oct. ° F.	Nov. ° F.	Dec. ° F.	Year. ° F.
---------------	--------------	---------------	--------------	--------------	--------------	---------------

**Victoria Nyanza District,
1° N.-3° S. 32° E.-35° E. :**

61.5	61.3	62.1	62.5	62.8	63.0	63.0	Entebbe.
61.8	61.5	62.1	63.2	63.6	63.5	63.7	Kisumu or Port Florence.
61.3	62.4	63.3	65.7	63.0	62.8	62.8	Shirati.
60.6	60.4	61.3	61.2	61.5	61.3	61.8	Bukoba.
59.5	59.5	59.4	60.1	60.3	60.3	60.3	Rubja (Bukoba).
61.9	62.8	64.2	64.9	64.8	64.0	64.0	Neuwied (Ukerewe).
58.6	59.9	61.7	62.4	62.1	61.5	61.0	Muansa.

**Equatorial Plateau, 1° N.-1½° S.
35° E.-38° E. :**

52.4	53.4	51.2	51.6	51.9	51.4	53.1	Nandi.
46.1	45.4	44.1	43.1	45.1	44.0	45.8	Eldama Ravine.
46.5	45.4	45.5	46.4	46.6	50.1	47.5	Naivasha.
51.4	51.8	54.3	56.4	56.2	55.3	54.2	Fort Hall.
48.9	51.4	49.5	47.2	47.3	45.6	48.7	Sotik.
46.3	47.1	47.5	49.8	51.2	49.7	49.3	Limoru.
47.7	48.2	50.1	55.1	53.1	52.7	52.0	Kikuyu.
49.5	50.3	50.8	53.4	55.0	53.3	52.5	Nairobi.
46.2	47.8	48.2	51.1	53.4	51.7	51.5	Machakos.

**South Frontier, 3° S.-5° S.
36° E.-39° E. :**

57.7	57.7	58.3	60.1	61.7	62.8	61.0	Moshi.
54.1	54.5	55.6	57.0	58.8	57.6	57.3	Arusha.
62.8	62.5	64.6	66.2	68.0	68.3	66.4	Voi, Taita.
58.6	58.5	59.2	60.6	60.5	58.6	60.6	Mwatate.
58.1	57.2	57.6	59.5	61.7	63.5	60.9	Amani.

Coast, 0°-6° S. 39° E.-43½° E. :

70.6	70.1	72.8	75.1	76.0	76.2	74.2	Lamu.
74.0	74.0	79.0	80.0	83.0	81.0	—	Malindi.
72.0	72.0	74.0	75.0	76.0	77.0	75.0	Mombasa.
68.1	68.1	68.9	70.0	73.0	74.9	72.1	Tanga.
68.0	67.7	68.4	69.8	71.8	73.1	70.8	Pemba.
72.8	72.7	73.6	75.3	77.2	79.1	76.4	Zanzibar.

TABLE IV

MEAN MONTHLY MAXIMUM TEMPERATURE

	Jan. ° F.	Feb. ° F.	Mar. ° F.	April. ° F.	May. ° F.	June. ° F.
Victoria Nyanza District, 1° N.-3° S. 32° E.-35° E. :						
Mengo	90.4	91.1	91.8	87.6	85.5	84.0
Entebbe	84.3	84.7	83.8	80.7	80.3	79.3
Kisumu or Port Florence.	92.1	94.5	92.5	87.6	86.2	84.8
Shirati	92.1	94.6	90.1	90.3	87.3	87.8
Bukoba	84.6	83.1	82.8	81.5	81.0	82.0
Rubja (Bukoba)	82.9	82.3	81.5	77.9	79.7	79.3
Neuwied (Ukerewe)	87.1	87.4	88.9	84.9	84.4	84.7
Muansa	89.8	91.9	90.5	88.5	87.6	87.6
Equatorial Plateau, 1° N.-1½° S. 35° E.-38° E. :						
Nandi	86.0	87.0	83.3	80.0	80.0	79.4
Eldama Ravine	80.0	82.0	82.5	81.5	79.7	81.2
Naivasha	85.7	85.8	85.0	82.3	81.5	80.7
Fort Hall	83.0	88.0	91.3	86.8	83.2	82.0
Sotik	92.3	90.3	88.7	86.3	84.3	83.3
Limoru	79.0	80.8	78.8	74.0	70.3	69.8
Kikuyu	77.5	79.2	75.0	75.0	72.0	69.3
Nairobi	82.2	84.8	83.9	81.1	77.3	77.4
Machakos	82.0	85.4	84.8	81.8	77.8	77.5
South Frontier, 3° S.-5° S. 36° E.-39° E. :						
Moshi	89.4	91.4	89.4	83.7	78.3	76.8
Arusha	89.2	90.5	89.2	84.4	79.0	75.7
Voi, Taita	92.5	94.0	95.5	91.0	92.5	95.0
Mwatate	88.5	92.0	94.2	93.5	85.3	87.6
Amani	84.6	86.0	86.4	81.9	79.2	75.7
Coast, 0°-6° S. 39° E.-43½° E. :						
Lamu	89.0	91.5	89.2	89.3	88.0	89.0
Malindi	—	—	—	88.0	86.0	84.0
Mombasa	88.0	89.0	90.0	89.0	85.0	83.5
Tanga	89.8	89.5	90.4	88.7	85.5	84.0
Pemba	90.4	88.8	91.2	87.3	83.7	82.5
Zanzibar	88.9	90.3	90.5	88.9	86.2	84.1

<i>July.</i> ° F.	<i>Aug.</i> ° F.	<i>Sept.</i> ° F.	<i>Oct.</i> ° F.	<i>Nov.</i> ° F.	<i>Dec.</i> ° F.	
Victoria Nyanza District, 1° N.-3° S. 32° E.-35° E. :						
83·8	82·3	84·2	86·2	86·6	89·4	Mengo.
78·8	80·0	82·6	83·8	82·9	83·5	Entebbe.
87·2	88·5	88·5	88·4	90·3	90·3	Kisumu or Port Florence.
85·5	86·2	89·4	89·1	88·0	90·1	Shirati.
81·1	81·9	83·1	83·7	83·7	83·1	Bukoba.
77·9	78·6	81·3	79·9	80·1	80·6	Rubja (Bukoba).
84·7	86·2	88·2	89·4	86·9	86·2	Neuwied (Ukerewe).
87·4	89·1	91·4	92·5	90·5	89·6	Muansa.
Equatorial Plateau, 1° N.-1½° S. 35° E.-38° E. :						
78·1	78·0	79·5	82·3	82·3	81·7	Nandi.
78·0	77·0	79·6	80·0	78·6	78·0	Eldama Ravine.
80·0	79·6	81·8	83·8	85·3	82·8	Naivasha.
80·0	83·2	87·0	86·4	86·6	83·2	Fort Hall.
84·3	86·3	88·8	87·7	87·0	88·0	Sotik.
70·0	70·8	75·0	77·3	75·3	74·0	Limoru.
70·3	75·0	77·0	78·3	73·7	73·0	Kikuyu.
76·6	78·1	80·7	82·0	80·7	78·3	Nairobi.
77·1	78·1	83·9	84·6	81·5	78·6	Machakos.
South Frontier, 3° S.-5° S 36° E.-39° E. :						
76·1	76·3	81·9	86·2	86·0	86·2	Moshi.
77·4	79·7	83·3	88·3	89·8	88·9	Arusha.
88·0	86·5	92·0	92·5	96·5	95·5	Voi, Taita.
80·3	86·0	87·6	91·2	90·7	87·6	Mwatate.
74·5	75·9	77·0	79·5	81·5	84·0	Amani.
Coast, 0°-6° S. 39° E.-43½° E. :						
86·0	86·0	89·0	86·2	87·0	89·0	Lamu.
82·0	81·0	83·0	86·0	85·0	85·0	Malindi.
82·0	81·0	83·0	85·0	87·0	87·5	Mombasa.
82·7	83·4	85·8	87·3	87·6	88·5	Tanga.
80·5	81·1	83·8	86·7	88·1	88·6	Pemba.
83·1	84·0	85·4	87·0	87·9	88·4	Zanzibar.

TABLE V

MEAN MONTHLY MINIMUM TEMPERATURE

	Jan. ° F.	Feb. ° F.	Mar. ° F.	April. ° F.	May. ° F.	June. ° F.
Victoria Nyanza District,						
1° N.-3° S. 32° E.-35° E. :						
Mengo	60.2	59.8	61.2	61.4	61.5	57.0
Entebbe	60.1	59.9	61.0	60.6	60.6	59.5
Kisumu or Port Florence	58.2	59.6	60.5	62.0	60.6	59.3
Shirati	59.4	60.1	60.1	58.8	57.2	58.1
Bukoba	57.7	58.5	60.1	60.1	60.6	59.4
Rubja (Bukoba)	56.8	57.2	57.2	57.4	57.6	57.1
Neuwied (Ukerewe)	59.5	59.9	61.2	60.3	60.4	59.9
Muansa	56.1	57.6	57.9	58.1	57.4	53.8
Equatorial Plateau, 1° N.-1½° S.-						
35° E.-38° E. :						
Nandi	49.0	50.0	51.6	51.0	50.6	50.0
Eldama Ravine	41.0	42.2	43.3	45.0	44.1	41.5
Naivasha	42.3	44.0	43.0	42.5	43.8	42.2
Fort Hall	47.2	48.0	51.2	52.4	50.4	47.6
Sotik	33.3	36.3	40.3	44.7	44.3	44.3
Limoru	43.5	45.3	46.0	49.5	46.3	42.5
Kikuyu	52.0	50.3	50.3	52.0	48.0	44.0
Nairobi	44.8	44.2	46.1	51.2	47.8	44.3
Machakos	49.3	48.7	51.4	51.6	46.7	43.2
South Frontier, 3° S.-5° S.						
36° E.-39° E. :						
Moshi	60.4	61.2	61.2	60.1	58.8	55.4
Arusha	52.3	53.8	53.8	55.4	55.2	50.5
Voi, Taita	63.5	64.5	63.5	58.0	63.5	61.0
Mwatate	57.7	57.3	54.7	58.4	57.5	53.5
Amani	59.9	59.4	59.5	59.0	57.9	53.6
Coast, 0°-6° S. 39° E.-43½° E. :						
Lamu	72.2	71.5	75.0	72.3	68.8	62.0
Malindi (2 yrs.)	—	—	—	79.0	74.0	73.5
Mombasa	72.0	73.0	74.0	72.0	71.0	69.0
Tanga	71.5	71.2	72.1	71.7	68.7	67.9
Pemba	70.7	70.7	70.6	68.7	68.8	66.8
Zanzibar	75.6	76.0	74.8	73.3	72.5	72.0

<i>July.</i> ° F.	<i>Aug.</i> ° F.	<i>Sept.</i> ° F.	<i>Oct.</i> ° F.	<i>Nov.</i> ° F.	<i>Dec.</i> ° F.	
						Victoria Nyanza District, 1° N.-3° S. 32° E.-35° E. :
58·8	59·2	58·5	59·5	59·2	59·7	Mengo.
58·2	58·8	58·7	59·9	60·0	59·7	Entebbe.
58·3	58·1	58·5	59·3	60·3	59·3	Kisumu or Port Florence.
58·1	59·2	60·1	60·3	59·4	59·9	Shirati.
59·2	57·0	57·2	58·6	58·6	59·4	Bukoba.
56·7	56·1	55·4	56·7	57·4	56·7	Rubja (Bukoba).
59·2	58·6	60·1	59·9	60·1	59·9	Neuwied (Ukerewe).
54·5	55·8	58·8	58·6	58·3	58·3	Muansa.
						Equatorial Plateau, 1° N.-1½° S. 35° E.-38° E. :
49·3	48·4	47·5	48·1	48·3	47·1	Nandi.
41·3	41·0	36·5	36·5	39·7	38·8	Eldama Ravine.
42·3	43·6	43·0	43·3	43·6	46·0	Naivasha.
46·4	45·4	48·5	51·2	52·4	50·8	Fort Hall.
40·0	42·7	38·7	39·3	38·8	38·3	Sotik.
40·8	41·2	40·8	43·8	47·5	44·5	Limoru.
44·0	40·5	48·3	49·7	57·0	50·7	Kikuyu.
41·9	42·0	42·5	46·2	48·3	47·8	Nairobi.
41·4	43·1	42·9	44·5	49·1	48·0	Machakos.
						South Frontier, 3° S.-5° S. 36° E.-39° E. :
54·5	55·2	55·6	56·8	59·4	60·6	Moshi.
49·8	49·3	51·6	50·4	53·8	52·5	Arusha.
59·0	59·5	61·0	63·5	63·0	66·0	Voi, Taita.
53·5	50·5	53·0	54·2	52·0	57·5	Mwatate.
54·1	52·3	52·9	54·1	55·8	59·5	Amani.
						Coast, 0°-6° S. 39° E.-43½° E. :
67·5	68·2	71·2	73·5	74·0	75·0	Lamu.
72·0	72·0	75·0	76·0	77·0	78·0	Malindi (2 yrs.).
67·0	68·0	68·0	70·0	71·0	71·0	Mombasa.
65·3	65·9	66·6	68·8	71·0	64·9	Tanga.
65·7	66·2	66·1	67·9	69·1	70·7	Pemba.
70·7	70·6	71·6	72·9	74·2	75·1	Zanzibar.

TABLE VI

RANGE OF TEMPERATURE (MEAN MONTHLY MAXIMUM LESS MEAN MONTHLY MINIMUM)

	Jan. ° F.	Feb. ° F.	Mar. ° F.	April. ° F.	May. ° F.	June. ° F.
Victoria Nyanza District, 1° N.-3° S. 32° E.-35° E. :						
Mengo	30.2	31.3	30.6	26.2	24.0	27.0
Entebbe	24.2	24.8	23.8	20.1	19.7	19.8
Kisumu or Port Florence.	33.9	34.9	32.0	25.6	25.6	25.5
Shirati	32.7	34.5	30.0	31.5	30.1	29.7
Bukoba	26.9	24.6	22.7	21.4	20.4	21.6
Rubja (Bukoba)	26.1	25.1	24.3	20.5	22.1	22.2
Neuwied (Ukerewe)	27.6	27.5	30.3	26.6	25.4	27.7
Muansa	33.7	34.3	32.6	30.4	30.2	33.8
Equatorial Plateau, 1° N.-1½° S. 35° E.-38° E. :						
Nandi	37.0	36.9	31.7	29.0	29.4	29.4
Eldama Ravine	39.0	39.8	39.2	36.5	35.6	39.7
Naivasha	43.4	41.8	42.0	39.8	37.7	38.5
Fort Hall	40.8	40.0	40.1	34.4	32.8	34.4
Sotik	59.0	54.0	48.4	41.6	39.7	39.0
Limoru	35.5	35.5	32.8	24.5	24.0	27.3
Kikuyu	24.5	28.9	24.7	23.0	24.0	25.3
Nairobi	37.4	40.6	37.8	29.9	29.5	33.1
Machakos	32.7	36.7	33.4	30.2	31.1	34.3
South Frontier, 3° S.-5° S. 36° E.-39° E. :						
Moshi	29.0	30.2	28.2	23.6	19.5	19.4
Arusha	36.9	36.7	35.4	29.0	23.8	25.2
Voi, Taita	29.0	29.5	32.0	33.0	29.0	34.0
Mwatate	30.8	34.7	39.5	34.5	27.3	34.1
Amani	24.7	26.6	26.9	22.9	21.3	22.1
Coast, 0°-6° S. 39° E.-43½° E. :						
Lamu	16.8	20.0	14.2	17.0	19.2	17.0
Malindi	—	—	—	9.0	12.0	10.5
Mombasa	16.0	16.0	16.0	17.0	14.0	14.5
Tanga	18.3	18.3	18.3	17.0	16.8	16.1
Pemba	19.7	18.1	20.6	18.6	14.9	15.7
Zanzibar	13.3	14.3	15.7	15.6	13.7	12.1

<i>July.</i> ° F.	<i>Aug.</i> ° F.	<i>Sept.</i> ° F.	<i>Oct.</i> ° F.	<i>Nov.</i> ° F.	<i>Dec.</i> ° F.	
Victoria Nyanza District, 1° N.-3° S. 32° E.-35° E. :						
25·0	23·1	25·7	26·7	27·4	29·7	Mengo.
20·6	21·2	23·9	23·9	22·9	23·8	Entebbe.
28·9	30·4	30·0	29·1	30·0	31·0	Kisumu or Port Florence.
27·4	27·0	29·3	28·8	29·6	30·2	Shirati.
21·9	24·9	25·9	25·1	25·1	23·7	Bukoba.
21·2	22·5	25·9	23·2	22·7	23·9	Rubja (Bukoba),
29·7	31·0	30·3	31·5	29·5	27·9	Neuwied (Ukerewe).
32·9	33·3	32·6	33·9	32·2	31·3	Muansa.
Equatorial Plateau, 1° N.-1½° S. 35° E.-38° E. :						
28·8	29·6	32·0	34·2	34·0	34·6	Nandi.
36·7	36·0	43·1	43·5	38·9	39·2	Eldama Ravine.
37·7	36·0	38·8	40·5	41·7	36·8	Naivasha.
33·6	37·8	38·5	35·2	34·2	32·4	Fort Hall.
44·3	43·6	50·0	48·4	48·2	49·7	Sotik.
29·2	28·6	34·2	33·5	27·8	29·5	Limoru.
26·3	34·5	28·7	28·6	22·7	22·3	Kikuyu.
34·7	36·1	38·2	35·8	32·4	30·5	Nairobi.
35·7	35·0	41·0	40·1	32·4	30·6	Machakos.
South Frontier, 3° S.-5° S. 36° E.-39° E. :						
21·6	21·1	26·3	29·4	26·6	25·6	Moshi.
27·6	30·4	31·7	37·9	36·0	36·4	Arusha.
29·0	27·0	31·0	29·0	33·5	29·5	Voi, Taita.
26·8	35·5	34·6	37·0	38·7	30·1	Mwatate.
20·4	23·6	24·1	25·4	25·7	24·5	Amani.
Coast, 0°-6° S. 39° E.-43½° E. :						
18·5	17·8	17·8	12·7	13·0	14·0	Lamu.
10·0	9·0	8·0	10·0	8·0	7·0	Malindi.
15·0	13·0	15·0	15·0	16·0	16·5	Mombasa.
17·4	17·5	19·2	18·5	17·6	17·5	Tanga.
14·8	14·9	17·7	18·8	19·0	17·9	Pemba.
12·4	13·4	13·8	14·1	13·7	13·3	Zanzibar.

TABLE VII

ABSOLUTE MAXIMUM TEMPERATURE

	Jan. ° F.	Feb. ° F.	Mar. ° F.	April. ° F.	May. ° F.	June. ° F.
Victoria Nyanza District, 1° N.-3° S. 32° E.-35° E. :						
Mengo	94.1	94.1	92.8	89.1	87.5	86.0
Entebbe	87.5	86.5	86.5	85.5	84.9	81.2
Kisumu or Port Florence	97.0	110.0	101.5	94.0	93.0	95.0
Shirati	98.3	98.1	95.0	101.7	89.4	94.8
Bukoba	88.0	85.6	86.0	89.4	90.5	90.0
Rubja (Bukoba)	86.4	83.7	84.0	80.6	82.8	85.1
Neuwied (Ukerewe)	91.4	90.0	92.5	89.6	87.8	86.2
Muansa	92.7	92.5	93.0	94.5	91.4	89.8
Equatorial Plateau, 1° N.-1½° S. 35° E.-38° E. :						
Nandi	101.0	99.0	90.0	85.0	86.0	85.0
Eldama Ravine	81.0	87.0	90.0	86.0	87.5	85.0
Naivasha	86.0	86.5	87.0	84.0	83.0	84.0
Fort Hall	96.0	92.0	95.0	90.0	86.0	85.0
Sotik	93.0	92.0	93.0	88.0	85.0	84.0
Limoru	89.0	89.0	86.0	80.0	75.0	72.0
Kikuyu	79.0	80.0	80.0	78.0	72.0	72.0
Nairobi	86.0	89.0	87.5	86.5	78.5	86.5
Machakos	86.0	88.0	87.5	86.5	80.5	80.0
South Frontier, 3° S.-5° S. 36° E.-39° E. :						
Moshi	93.2	93.4	93.6	88.2	82.6	81.5
Arusha	97.3	95.4	95.9	91.9	83.8	76.6
Voi, Taita	94.0	96.0	98.0	94.0	94.0	95.0
Mwatate	90.5	93.0	95.0	94.8	86.0	92.2
Amani	86.9	88.2	89.6	84.0	83.8	77.7
Coast, 0°-6° S. 39° E.-43½° E. :						
Lamu	92.0	93.0	92.0	91.0	90.0	98.0
Malindi	84.0	85.0	87.0	89.0	89.0	87.0
Mombasa	92.0	93.0	98.0	91.0	89.0	88.0
Tanga	93.0	95.0	92.0	91.0	88.0	86.0
Pemba	94.0	95.0	94.0	89.0	85.0	83.0
Zanzibar	90.8	91.6	92.0	90.9	87.2	85.7

July. ° F.	Aug. ° F.	Sept. ° F.	Oct. ° F.	Nov. ° F.	Dec. ° F.	Year. ° F.
---------------	--------------	---------------	--------------	--------------	--------------	---------------

**Victoria Nyanza District,
1° N.-3° S. 32° E.-35° E. :**

84.5	82.7	85.0	[86.2]	92.8	95.0	95.0	Mengo.
81.0	83.0	86.2	86.2	85.0	89.0	89.0	Entebbe.
95.5	97.0	95.0	95.0	95.0	95.0	110.0	Kisumu or Port Florence.
87.8	89.2	94.8	91.2	90.0	98.1	101.7	Shirati.
91.4	85.3	87.1	88.9	92.8	86.4	92.8	Bukoba.
82.0	79.7	84.6	81.5	82.8	85.3	86.4	Rubja (Bukoba).
86.0	88.2	89.6	90.9	88.9	89.4	92.5	Neuwied (Ukerewe).
89.6	92.3	95.9	97.9	91.9	91.4	97.9	Muansa.

**Equatorial Plateau, 1° N.-1½° S.
35° E.-38° E. :**

86.0	83.0	82.0	98.0	100.0	91.0	101.0	Nandi.
81.0	80.0	85.0	83.0	80.0	82.0	90.0	Eldama Ravine.
84.0	85.0	87.0	88.0	89.0	86.0	89.0	Naivasha.
82.0	87.0	90.0	92.0	89.0	87.0	96.0	Fort Hall.
85.0	89.0	90.0	88.0	89.0	91.0	93.0	Sotik.
72.0	76.0	83.0	84.0	84.0	83.0	89.0	Lamoru.
72.0	75.0	79.0	81.0	79.0	75.0	81.0	Kikuyu.
81.6	85.0	84.0	86.0	88.0	81.0	89.0	Nairobi.
79.5	82.6	87.3	85.0	84.5	81.0	88.0	Machakos.

**South Frontier, 3° S.-5° S.
36° E.-39° E. :**

79.0	80.4	84.0	88.7	89.8	91.4	93.6	Moshi.
79.5	84.0	87.8	93.7	101.8	94.8	101.8	Arusha.
89.0	87.0	95.0	93.0	100.0	96.0	100.0	Voi, Taita.
82.7	86.0	87.3	92.3	92.0	88.3	95.0	Mwatate.
77.2	79.5	80.8	87.3	83.7	90.1	90.1	Amani.

Coast, 0°-6° S. 39° E.-43½° E. :

90.0	90.0	100.0	90.0	88.0	92.0	100.0	Lamu.
84.0	83.0	85.0	88.0	87.0	87.0	89.0	Malindi.
86.0	86.3	86.0	88.0	91.0	93.0	98.0	Mombasa.
86.0	86.0	87.0	95.0	92.0	95.0	95.0	Tanga.
82.0	84.0	85.0	88.0	90.5	92.0	95.0	Pemba.
86.7	85.2	87.5	88.9	91.7	92.8	92.8	Zanzibar.

TABLE VIII

ABSOLUTE MINIMUM TEMPERATURE

	<i>Jan.</i> ° F.	<i>Feb.</i> ° F.	<i>Mar.</i> ° F.	<i>April.</i> ° F.	<i>May.</i> ° F.	<i>June.</i> ° F.
Victoria Nyanza District,						
1° N.-3° S. 32° E.-35° E. :						
Mengo	62.0	61.0	62.0	61.5	62.0	60.0
Entebbe	58.0	57.0	60.0	59.0	58.0	58.0
Kisumu or Port Florence	45.0	53.0	52.0	53.0	57.0	58.0
Shirati	53.2	53.1	53.1	53.2	50.0	50.5
Bukoba	47.1	50.7	51.4	51.3	51.6	49.8
Rubja (Bukoba)	55.8	55.8	55.8	55.9	55.9	55.4
Neuweid (Ukerewe)	57.0	58.3	58.6	58.3	59.0	57.0
Muansa	49.8	52.9	52.2	54.3	54.1	50.4
Equatorial Plateau, 1° N.-1½° S.						
35° E.-38° E. :						
Nandi	46.0	45.0	49.0	43.0	40.0	40.0
Eldama Ravine	35.6	36.0	37.0	38.0	37.0	36.0
Náivasha	42.0	42.0	40.0	42.0	42.0	40.0
Fort Hall	42.0	43.0	46.0	46.0	45.0	43.0
Sotik	32.0	35.0	38.0	42.0	42.0	42.0
Limoru	41.0	45.0	43.0	48.0	43.0	41.0
Kikuyu	48.0	45.0	42.0	49.0	42.0	40.0
Nairobi	41.5	40.0	40.0	47.0	44.5	41.0
Machakos	46.0	44.0	45.0	49.0	39.0	36.0
South Frontier, 3° S.-5° S.						
36° E.-39° E. :						
Moshi	59.4	59.0	59.5	56.8	57.4	50.5
Arusha	50.4	48.4	49.8	51.6	50.5	46.2
Voi, Taita	62.0	64.0	63.0	50.0	63.0	61.0
Mwatate	57.0	56.7	53.5	57.8	57.0	53.0
Amani	55.0	57.4	56.7	43.9	48.2	52.9
Coast, 0°-6° S. 39° E.-43½° E. :						
Lamu	69.0	68.0	70.0	70.0	61.0	53.0
Malindi	78.0	79.0	80.0	76.0	75.0	73.0
Mombasa	71.0	70.0	60.0	68.9	69.0	67.0
Tanga	69.0	68.4	71.0	69.0	65.7	64.0
Pemba	70.0	68.0	69.5	66.0	68.6	66.0
Zanzibar	72.2	71.6	72.2	69.9	71.4	69.2

July. ° F.	Aug. ° F.	Sept. ° F.	Oct. ° F.	Nov. ° F.	Dec. ° F.	Year. ° F.
---------------	--------------	---------------	--------------	--------------	--------------	---------------

**Victoria Nyanza District,
1° N.-3° S. 32° E.-35° E. :**

59.5	60.0	59.0	[59.5]	59.5	61.0	59.0	Mengo.
55.0	56.9	56.0	58.0	58.2	55.2	55.0	Entebbe.
56.0	54.0	54.0	52.0	56.0	57.0	45.0	Kisumu or Port Florence.
55.0	54.0	55.8	55.9	54.1	54.9	50.0	Shirati.
48.9	51.1	49.3	50.5	49.5	49.8	47.1	Bukoba.
52.7	54.9	54.9	54.0	55.8	55.9	52.7	Rubja (Bukoba).
55.0	55.2	57.9	57.9	57.4	58.3	55.0	Neuwied (Ukerewe).
51.4	53.2	54.9	55.4	55.0	56.1	49.8	Muansa.

**Equatorial Plateau, 1° N.-1½° S.
35° E.-38° E. :**

39.0	40.0	44.0	46.0	46.0	42.0	39.0	Nandi.
36.0	33.0	30.0	30.0	30.0	30.0	30.0	Eldama Ravine.
42.0	42.0	42.0	42.0	43.0	40.0	40.0	Naivasha.
40.0	41.0	40.0	46.0	45.0	48.0	40.0	Fort Hall.
34.0	41.0	34.0	38.0	36.0	36.0	32.0	Sotik.
36.0	36.0	39.0	42.0	46.0	43.0	36.0	Limoru.
40.0	40.0	47.0	47.0	49.0	48.0	40.0	Kikuyu.
37.0	36.5	38.0	42.0	45.0	45.0	36.5	Nairobi.
36.0	37.0	38.5	38.0	42.0	33.0	33.0	Machakos.

**South Frontier, 3° S.-5° S.
36° E.-39° E. :**

53.6	53.2	54.5	55.0	58.1	58.3	50.5	Moshi.
44.6	46.2	50.0	48.6	50.9	49.8	44.6	Arusha.
58.0	58.0	61.0	63.0	62.0	65.0	50.0	Voi, Taita.
52.0	50.0	53.0	54.0	50.0	53.0	50.0	Mwatate.
51.1	45.9	50.4	49.8	48.7	55.0	43.9	Amani.

Coast, 0°-6° S. 39° E.-43½° E. :

59.0	60.0	68.0	70.0	72.0	73.0	52.0	Lamu.
70.0	70.0	75.0	76.0	76.0	77.0	70.0	Malindi.
61.0	65.0	67.0	69.0	69.0	68.0	60.0	Mombasa.
62.8	62.0	60.0	64.0	66.9	65.7	60.0	Tanga.
65.0	66.0	64.0	67.0	66.0	70.0	64.0	Pemba.
67.8	68.0	69.0	71.5	72.2	69.6	67.8	Zanzibar.

TABLE IX

MEAN RAINFALL

	Jan. in.	Feb. in.	Mar. in.	April. in.	May. in.	June. in.
Victoria Nyanza District,						
1° N.-3° S. 32° E.-35° E. :						
Mengo	2.11	2.29	3.54	5.94	3.56	3.09
Entebbe	2.81	3.26	6.10	10.12	8.25	4.77
Mumias	2.43	3.92	5.21	10.09	8.95	6.89
Kisumu or Port Florence.	2.30	3.66	6.20	7.22	5.35	4.05
Shirati	1.81	2.36	2.20	6.77	5.39	1.06
Bukoba	4.21	4.88	8.66	16.70	11.54	1.73
Rubja (Bukoba)	4.37	4.65	8.98	16.10	11.10	1.81
Neuwied (Ukerewe) . . .	5.00	4.00	5.56	13.16	3.80	1.00
Muansa	2.91	3.11	5.63	9.45	2.99	1.23
Equatorial Plateau, 1° N.-1½° S.						
35° E.-38° E. :						
Baringo	0.54	1.70	1.71	4.30	3.78	3.10
Nandi	2.45	3.28	5.50	8.64	9.16	6.70
Eldama Ravine	1.06	2.06	3.27	6.84	5.37	5.01
Lumbwa	1.69	2.92	4.45	8.86	7.40	6.33
Muhoroni	2.67	5.29	5.78	11.57	6.92	6.02
Kericho	2.45	3.46	6.42	9.78	8.77	6.42
Naivasha	1.12	1.38	3.10	5.76	3.56	3.46
Fort Hall	1.17	2.55	4.48	12.99	6.05	1.65
Sotik	3.18	4.55	6.91	7.86	4.22	3.94
Limoru	1.91	3.23	4.64	12.08	10.71	2.82
Kikuyu	1.55	3.22	6.20	9.93	7.00	2.09
Kitui	1.81	1.65	4.71	9.12	2.46	0.20
Nairobi	2.25	2.64	4.82	8.74	5.11	1.88
Machakos	1.33	2.98	5.05	8.37	2.64	0.71
South Frontier, 3° S.-5° S.						
36° E.-39° E. :						
Moshi	1.65	3.90	4.65	17.73	12.70	1.85
Arusha	2.91	4.17	7.64	13.42	6.30	1.10
Voi, Taita (6 yrs.) . . .	1.12	1.49	2.54	2.68	1.26	0.27
Mwatate (8 yrs.)	1.45	1.03	3.24	5.01	1.98	0.48
Taveta (8 yrs.)	1.60	1.71	2.66	5.70	2.90	0.15
Amani	4.24	2.43	6.23	15.72	11.20	3.56
Coast, 0°-6° S. 39° E.-43½° E. :						
Kismayu	0.03	0.02	0.18	1.70	5.50	2.96
Lamu	0.03	0.22	0.87	5.07	13.02	4.94
Malindi	0.25	0.20	1.06	6.30	13.63	4.82
Mombasa	0.78	0.86	2.36	8.08	13.49	3.65
Shimoni	1.04	0.88	3.21	11.81	16.41	4.63
Tanga	1.66	2.07	3.30	11.84	12.66	2.42
Pemba	2.64	2.05	6.00	22.52	16.50	5.00
Zanzibar	3.37	2.41	6.01	13.85	11.42	1.79

<i>July.</i> in.	<i>Aug.</i> in.	<i>Sept.</i> in.	<i>Oct.</i> in.	<i>Nov.</i> in.	<i>Dec.</i> in.	<i>Year.</i> in.	
Victoria Nyanza District:							
1° N.-3° S. 32° E.-35° E. :							
2.49	6.41	4.66	4.32	9.27	3.21	50.90	Mengo.
2.93	3.17	2.95	3.53	5.37	5.70	58.96	Entebbe.
5.54	6.43	5.76	5.83	5.75	4.20	71.00	Mumias.
2.15	3.18	2.27	2.32	3.30	4.75	46.75	Kisumu or Port Florence.
0.55	0.31	0.63	1.50	1.85	2.50	26.93	Shirati.
1.30	2.87	3.15	4.52	8.55	7.20	75.31	Bukoba.
1.48	3.03	3.50	4.37	8.50	7.40	75.30	Rubja (Bukoba).
0.50	3.00	1.52	3.80	5.48	6.28	53.10	Ukerewe (Bukoba).
0.20	0.91	1.57	2.99	4.72	4.41	40.20	Muansa.
Equatorial Plateau, 1° N.-1½° S.							
35° E.-38° E. :							
4.05	3.58	1.59	1.18	2.86	0.59	28.98	Baringo.
7.63	8.44	6.68	4.57	3.77	2.28	69.10	Nandi.
3.93	5.16	2.69	1.99	3.30	2.06	42.74	Eldama Ravine.
5.67	6.27	3.80	2.93	2.73	2.00	55.15	Lumbwa.
3.72	7.15	5.63	4.99	6.90	6.20	72.84	Muhoroni.
5.72	7.40	6.15	5.72	5.82	3.90	72.01	Kericho.
1.83	2.23	1.72	1.90	2.96	1.90	30.92	Naivasha.
0.85	0.87	0.77	4.58	8.41	3.60	47.97	Fort Hall.
2.33	2.99	3.10	2.94	5.00	3.70	50.72	Sotik.
1.09	1.99	1.60	2.69	6.92	3.09	52.77	Limoru.
0.76	0.92	1.40	1.93	5.18	3.07	48.25	Kikuyu.
0.18	0.17	0.15	2.38	13.91	5.84	42.59	Kitui.
0.69	1.20	1.08	2.08	6.07	2.65	39.81	Nairobi.
0.31	0.37	0.19	2.24	7.55	4.87	36.61	Machakos.
South Frontier, 3° S.-5° S.							
36° E.-39° E. :							
2.16	1.10	0.91	1.10	3.54	2.56	53.85	Moshi.
0.75	0.43	1.30	1.50	5.51	3.42	48.45	Arusha.
0.10	0.35	0.23	0.56	2.74	3.24	16.58	Voi, Taita (6 yrs.).
0.50	0.18	0.38	0.91	3.62	3.55	22.33	Mwatate (8 yrs.).
0.38	0.17	0.08	0.31	3.97	2.09	21.72	Taveta (8 yrs.).
4.17	3.16	4.14	6.29	7.99	6.89	76.02	Amani.
Coast, 0°-6° S. 39° E.-43½° E. :							
1.99	0.90	0.70	0.16	0.85	0.15	15.14	Kismayu.
1.56	1.48	1.22	1.60	0.92	0.84	31.77	Lamu.
3.80	1.55	1.23	2.42	2.5	0.86	38.62	Malindi.
3.55	2.23	2.30	3.56	4.90	2.04	47.80	Mombasa.
4.76	2.22	1.97	2.57	3.57	2.17	55.24	Shimoni.
4.41	3.09	3.00	3.68	7.89	2.43	58.45	Tanga.
3.59	1.45	1.27	2.17	7.56	6.80	77.55	Pemba.
2.78	1.72	2.10	3.67	8.64	5.54	63.30	Zanzibar.

TABLE X

MAXIMUM RAINFALL IN MONTH AND YEAR

	Jan. in.	Feb. in.	Mar. in.	April. in.	May. in.	June. in.
Victoria Nyanza District, 1° N.-3° S. 32° E.-35° E. :						
Mengo	3.495	3.160	4.229	7.867	6.150	4.357
Entebbe	7.99	7.32	9.87	15.79	15.80	10.26
Mumias	7.04	9.88	9.72	21.41	11.96	16.40
Kisumu or Port Florence.	5.92	15.54	12.95	13.31	9.01	9.28
Bukoba	7.80	8.90	12.96	30.04	28.80	6.64
Neuwied (Ukerewe)	10.16	15.00	12.76	19.28	6.20	2.50
Muansa	4.40	7.60	6.80	12.40	16.60	14.20
Equatorial Plateau, 1° N.-1½° S. 35° E.-38° E. :						
Baringo	2.38	7.44	4.76	9.67	6.39	5.47
Nandi	6.34	9.92	7.57	12.44	13.79	9.88
Eldama Ravine	3.19	7.66	10.41	11.00	15.40	10.16
Lumbwa	5.66	10.70	7.02	23.0	16.90	14.70
Muhoroni	9.71	15.73	11.09	26.55	17.90	12.35
Kericho	5.65	8.83	10.73	15.18	11.90	12.25
Naivasha	4.05	4.76	9.49	11.42	8.76	12.45
Fort Hall	5.30	7.34	12.10	19.02	17.81	2.94
Sotik	7.73	10.82	10.14	10.91	7.71	5.71
Limoru	4.48	12.63	13.09	21.94	16.91	6.15
Kikuyu	5.54	14.88	13.65	15.73	14.54	2.74
Kitui	7.93	5.70	13.56	14.95	6.85	0.78
Nairobi	6.30	13.90	11.79	13.52	9.89	5.34
Machakos	8.11	13.01	19.17	16.30	5.97	2.41
South Frontier, 3° S.-5° S. 36° E.-39° E. :						
Moshi	4.57	6.18	14.10	30.40	18.30	3.94
Arusha	6.22	6.50	21.20	19.09	10.71	2.52
Voi, Taita (6 yrs.)	3.63	4.95	5.12	7.07	2.13	0.73
Mwatate (4 yrs.)	3.08	5.19	2.54	6.96	2.67	0.61
Taveta	4.64	7.40	5.32	8.34	4.91	0.21
Amani	7.87	6.73	13.19	30.24	19.29	8.62
Coast, 0°-6° S. 39° E.-43½° E. :						
Kismayu	0.60	0.34	2.19	6.85	13.03	9.33
Lamu	0.21	1.04	2.97	15.50	21.60	10.72
Malindi	0.75	1.06	3.86	18.50	27.44	13.26
Mombasa	4.09	3.27	6.62	20.29	25.40	15.30
Shimoni	4.10	3.01	14.37	27.12	25.41	9.24
Tanga	3.07	5.12	5.28	32.10	21.40	6.49
Pemba	8.20	12.09	13.15	39.01	27.40	12.13
Zanzibar	6.71	10.74	10.63	30.52	21.25	8.12

July. in.	Aug. in.	Sept. in.	Oct. in.	Nov. in.	Dec. in.	Year. in.
--------------	-------------	--------------	-------------	-------------	-------------	--------------

**Victoria Nyanza District,
1° N.-3° S. 32° E.-35° E. :**

3.503	6.695	6.818	4.397	12.921	3.874	—	Mengo.
5.72	6.75	5.62	6.50	12.05	12.51	75.71	Entebbe.
11.28	9.93	16.23	11.08	13.43	9.73	92.89	Mumias.
4.99	7.09	6.15	6.12	12.40	13.77	71.24	Kisumu or Port Florence.
6.00	14.92	9.24	6.76	13.16	15.92	106.6	Bukoba.
2.60	6.64	4.00	7.28	10.08	12.48	64.32	Neuwied (Ukerewe).
1.48	9.04	11.04	18.80	24.04	9.48	113.40	Muansa.

**Equatorial Plateau, 1° N.-1½° S.
35° E.-38° E. :**

7.61	8.79	3.37	2.81	11.30	1.73	37.30	Baringo.
12.11	12.31	12.44	7.44	7.74	5.24	99.08	Nandi.
8.58	12.56	7.84	3.47	7.75	6.23	55.55	Eldama Ravine.
10.75	15.01	8.76	7.00	6.50	5.18	85.52	Lumbwa.
17.40	16.03	12.00	14.03	14.38	20.70	97.24	Muhoroni.
8.51	11.23	14.15	7.80	11.88	7.08	88.0	Kericho.
6.75	4.41	5.65	3.90	7.11	6.46	55.58	Naivasha.
2.27	2.09	3.39	9.62	13.92	12.18	60.52	Fort Hall.
5.15	5.75	5.54	4.03	7.38	6.61	59.26	Sotik.
2.07	4.39	3.63	4.55	14.29	8.91	75.96	Limoru.
1.94	1.85	3.34	3.99	12.05	7.71	56.35	Kikuyu.
1.19	0.55	0.14	8.80	22.78	16.88	62.77	Kitui.
2.93	2.91	3.10	5.29	13.01	7.10	55.86	Nairobi.
1.09	1.72	5.85	5.25	12.37	9.65	58.32	Machakos.

**South Frontier, 3° S.-5° S.
36° E.-39° E. :**

4.88	3.19	1.02	2.01	5.43	5.10	69.6	Moshi.
1.41	1.64	0.88	1.73	8.34	4.00	57.40	Arusha.
0.47	1.67	0.63	1.88	4.73	6.66	22.07	Voi, Taita (6 yrs.).
1.19	0.49	0.33	1.44	4.72	7.72	40.42	Mwatate (4 yrs.).
1.26	0.77	0.30	1.03	9.79	5.53	29.17	Taveta.
8.39	5.76	12.38	19.02	17.32	15.75	93.82	Amani.

Coast, 0°-6° S. 39° E.-43½° E. :

4.49	2.05	6.08	0.80	3.80	1.82	29.53	Kismayu.
2.45	4.00	2.07	9.85	3.77	3.63	44.16	Lamu.
9.26	2.84	5.35	8.76	5.77	3.76	59.18	Malindi.
8.20	4.91	6.77	12.21	27.67	8.00	73.36	Mombasa.
8.68	6.05	3.95	6.76	5.21	5.90	81.10	Shimoni.
8.82	6.73	6.30	13.20	13.1	5.62	83.92	Tanga.
5.54	2.50	3.54	2.92	13.34	16.86	105.24	Pemba.
5.10	3.65	6.59	6.85	15.34	17.82	93.00	Zanzibar.

TABLE XI

MINIMUM RAINFALL IN MONTH AND YEAR

	<i>Jan.</i> in.	<i>Feb.</i> in.	<i>Mar.</i> in.	<i>April.</i> in.	<i>May.</i> in.	<i>June.</i> in.
Victoria Nyanza District, 1° N.-3° S. 32° E.-35° E. :						
Mengo	1·178	1·420	2·845	4·022	1·095	1·321
Entebbe	0·61	0·26	0·83	5·43	2·70	0·97
Mumias	0·00	0·89	1·19	4·36	4·20	2·32
Kisumu or Port Florence.	0·00	0·33	1·04	2·79	1·88	0·67
Bukoba	0·88	1·56	7·76	14·12	6·72	0·00
Neuwied (Ukerewe) . . .	2·56	0·70	0·30	6·76	1·52	0·00
Muansa	1·36	1·52	2·08	3·04	0·64	0·00
Equatorial Plateau, 1° N.-1½° S. 35° E.-38° E. :						
Baringo	0·00	0·00	0·00	1·20	1·36	0·68
Nandi	0·00	0·52	0·12	5·39	5·95	4·60
Eldama Ravine	0·00	0·00	0·03	1·62	1·94	0·94
Lumbwa	0·00	0·00	0·00	4·15	2·90	2·55
Muhoroni	0·00	0·00	0·00	2·31	0·00	0·50
Kericho	0·84	0·17	0·42	6·18	5·84	4·11
Naivasha	0·00	0·00	0·00	1·05	0·00	0·00
Fort Hall	0·00	0·00	0·00	5·46	1·22	0·25
Sotik	0·88	1·01	3·82	5·74	2·05	1·77
Limoru	0·01	0·00	0·16	5·40	3·02	1·12
Kikuyu	0·00	0·00	0·00	4·28	3·05	0·00
Kitui	0·00	0·00	0·00	2·78	0·41	0·00
Nairobi	0·04	0·00	0·00	3·84	0·62	0·20
Machakos	0·00	0·00	0·05	2·25	0·04	0·00
South Frontier, 3° S.-5° S. 36° E.-39° E. :						
Moshi	0·67	0·24	0·004	5·32	7·56	0·01
Arusha	0·75	0·12	0·04	8·60	2·28	0·22
Voi, Taita	0·28	0·03	0·91	0·61	0·14	0·00
Mwatate	0·00	0·00	0·00	1·46	0·26	0·04
Taveta	0·09	0·00	0·12	1·12	0·52	0·00
Amani	0·004	0·00	0·78	8·10	3·02	1·00
Coast, 0°-6° S. 39° E.-43½° E. :						
Kismayu	0·00	0·00	0·00	0·00	0·05	0·84
Lamu	0·00	0·00	0·00	0·14	0·44	0·72
Malindi	0·00	0·00	0·00	2·04	0·68	1·17
Mombasa	0·00	0·00	0·00	1·56	2·20	0·52
Shimoni	00·0	0·00	0·56	5·35	1·84	2·14
Tanga	0·08	0·02	0·12	3·15	1·58	0·24
Pemba	0·40	0·01	0·14	9·66	2·23	1·44
Zanzibar	0·04	0·01	0·31	6·68	3·45	0·02

July. in.	Aug. in.	Sept. in.	Oct. in.	Nov. in.	Dec. in.	Year. in.	
Victoria Nyanza District, 1° N.-3° S. 32° E.-35° E. :							
1.474	6.132	2.502	4.250	4.856	2.355	—	Mengo.
0.31	0.18	0.64	0.96	0.90	1.63	47.02	Entebbe.
1.39	2.56	1.22	2.57	2.44	0.68	56.21	Mumias.
0.08	0.36	0.13	0.61	0.74	0.00	30.43	Kisumu or Port Florence.
0.28	1.76	0.20	0.96	5.88	2.96	—	Bukoba.
0.00	0.40	0.16	0.04	0.44	2.08	44.00	Neuwied (Ukerewe).
0.00	0.16	0.00	0.08	3.48	1.16	—	Muansa.

Equatorial Plateau, 1° N.-1½° S.
35° E.-38° E. :

1.88	0.55	0.00	0.06	0.65	0.20	23.66	Baringo.
4.39	0.21	1.20	0.95	1.88	0.04	50.27	Nandi.
0.36	1.10	0.06	0.53	1.18	0.12	30.61	Eldama Ravine.
0.52	1.65	1.40	0.00	0.55	0.00	35.87	Lumbwa.
0.00	2.07	2.50	0.00	0.21	0.90	36.86	Muhoroni.
2.43	2.93	1.66	2.72	1.73	1.07	59.6	Kericho.
0.00	0.00	0.08	0.74	1.08	0.00	10.29	Naivasha.
0.00	0.00	0.00	0.14	5.32	0.34	39.63	Fort Hall.
0.80	1.32	1.51	1.61	2.74	1.82	39.5	Setik.
0.32	0.10	0.55	0.38	3.75	0.18	35.18	Limoru.
0.00	0.00	0.00	0.00	2.69	0.15	23.14	Kikuyu.
0.00	0.00	0.00	0.00	8.64	1.55	31.70	Kitui.
0.06	0.00	0.00	0.13	2.20	0.38	25.62	Nairobi.
0.00	0.02	0.00	0.00	2.47	0.32	21.37	Machakos.

South Frontier, 3° S.-5° S.
36° E.-39° E. :

1.26	0.008	0.05	0.004	0.43	0.16	43.6	Moshi.
0.16	0.16	0.02	0.01	0.32	0.17	25.74	Arusha.
0.00	0.00	0.01	0.00	0.31	0.27	11.47	Voi, Taita.
0.05	0.00	0.00	0.00	1.33	1.09	11.14	Mwatate.
0.00	0.00	0.00	0.00	0.16	0.10	10.29	Taveta.
1.86	0.31	0.88	0.31	3.97	1.63	47.37	Amani.

Coast, 0°-6° S. 39° E.-43½° E. :

0.14	0.00	0.00	0.00	0.00	0.00	6.68	Kismayu.
0.78	0.00	0.57	0.00	0.04	0.00	17.57	Lamu.
1.85	0.80	0.00	0.16	0.14	0.00	14.44	Malindi.
1.02	0.39	0.36	0.83	0.11	0.25	22.10	Mombasa.
1.72	0.85	0.24	0.14	0.76	0.03	27.30	Shimoni.
0.74	1.34	0.12	0.28	1.30	0.00	33.90	Tanga.
1.06	0.49	0.11	0.02	2.95	1.80	54.02	Pemba.
0.22	0.33	0.67	0.89	2.79	0.45	42.00	Zanzibar.

TABLE XII

MAXIMUM RAINFALL IN 24 HOURS

	<i>Jan.</i> in.	<i>Feb.</i> in.	<i>Mar.</i> in.	<i>April.</i> in.	<i>May.</i> in.	<i>June.</i> in.
Victoria Nyanza District,						
1° N.-3° S. 32° E.-35° E. :						
Entebbe	2.40	2.11	3.80	3.63	2.98	3.10
Kisumu (5 yrs.)	1.65	2.97	3.20	3.10	2.50	1.76
Bukoba (2-3 yrs.)	1.92	2.64	1.56	3.92	5.28	3.84
Neuwied (Ukerewe)	5.00	2.00	2.52	3.88	2.20	1.52
Muansa (2-3 yrs.)	1.16	1.68	1.60	2.56	2.84	2.00
Equatorial Plateau, 1° N.-1½° S.						
35° E.-38° E. :						
Nandi (5 yrs.)	0.80	2.45	1.25	2.40	1.30	2.26
Eldama Ravine (7 yrs.) . . .	0.92	2.32	1.50	2.24	1.69	1.82
Fort Hall (5-8 yrs.)	2.00	2.35	3.56	4.60	4.60	0.79
Sotik (3 yrs.)	0.53	2.35	1.42	1.65	1.25	1.12
Limoru (4 yrs.)	0.63	1.93	2.45	3.44	2.20	1.43
Kikuyu (5-6 yrs.)	2.00	2.65	4.28	1.51	4.90	1.34
Nairobi (9 yrs.)	2.66	2.62	1.77	3.01	2.90	3.88
Machakos (6-9 yrs.)	0.92	3.91	3.13	4.14	2.11	1.0
South Frontier, 3° S.-5° S.						
36° E.-39° E. :						
Moshi (5 yrs.)	2.28	2.95	3.96	4.00	6.12	1.32
Voi, Taita (2 yrs.)	1.30	1.70	1.40	0.85	0.50	0.00
Mwatate (2 yrs.)	0.70	3.41	1.21	3.33	0.52	0.15
Amani (3-5 yrs.)	1.84	1.72	4.48	6.40	2.80	3.20
Coast, 0°-6° S. 39° E.-43½° E. :						
Kismayu (2-3 yrs.)	0.0	0.0	0.0	1.04	5.97	1.83
Lamu (4 yrs.)	0.02	1.04	1.05	3.57	3.90	1.62
Malindi (3 yrs.)	0.33	0.8	0.75	2.85	3.96	3.39
Mombasa	0.93	2.05	3.36	3.80	8.15	3.68
Shimoni (2 yrs.)	1.13	1.90	1.54	2.42	3.50	1.99
Tanga	1.61	1.94	5.04	6.48	7.14	3.00
Pemba (7 yrs.)	1.97	1.80	2.09	6.53	4.21	1.42
Zanzibar	2.59	2.09	2.92	5.73	4.82	2.65

<i>July.</i> in.	<i>Aug.</i> in.	<i>Sept.</i> in.	<i>Oct.</i> in.	<i>Nov.</i> in.	<i>Dec.</i> in.	
Victoria Nyanza District, 1° N.-3° S. 32° E.-35° E. :						
2.42	2.72	2.86	2.48	3.81	2.62	Entebbe.
1.94	1.35	0.75	1.26	2.34	0.78	Kisumu (5 yrs.).
1.04	0.84	0.84	1.92	2.80	1.96	Bukoba (2-3 yrs.).
0.80	2.40	1.56	2.72	4.80	3.16	Neuwied (Ukerewe).
0.20	2.00	1.48	3.12	2.28	2.56	Muansa (2-3 yrs.).
Equatorial Plateau, 1° N.-1½° S. 35° E.-38° E. :						
1.38	2.54	2.08	1.07	2.06	1.35	Nandi (5 yrs.).
1.50	1.45	1.42	0.80	1.03	1.00	Eldama Ravine (7 yrs.).
1.19	0.54	0.75	4.16	3.00	1.84	Fort Hall (5-8 yrs.).
1.72	1.34	0.70	1.24	1.70	1.31	Sotik.
0.63	1.56	0.91	1.30	1.98	2.67	Limoru (4 yrs.).
1.03	0.33	2.50	1.60	1.12	2.70	Kikuyu (5-6 yrs.).
0.66	1.07	1.04	1.40	2.46	1.42	Nairobi (4 yrs.).
0.22	0.47	0.68	2.50	2.47	4.79	Machakos (6-9 yrs.).
South Frontier, 3° S.-5° S. 36° E.-39° E. :						
1.2	1.52	0.86	0.94	3.6	1.07	Moshi (5 yrs.).
0.00	0.03	0.27	0.83	2.15	1.95	Voi, Taita (2 yrs.).
0.55	0.05	0.13	1.25	1.00	0.90	Mwatate (2 yrs.).
1.96	2.54	3.52	6.24	3.80	2.24	Amani (3-5 yrs.).
Coast, 0°-6° S. 39° E.-43½° E. :						
0.83	0.20	0.32	0.80	1.00	0.0	Kismayu (2-3 yrs.).
0.56	2.70	0.99	1.00	1.05	1.80	Lamu (4 yrs.).
3.75	0.80	1.98	5.15	2.40	1.25	Malindi (3 yrs.).
4.42	2.17	4.46	5.50	2.39	1.72	Mombasa.
2.06	1.50	0.62	1.89	1.30	2.57	Shimoni (2 yrs.).
3.29	2.88	2.90	8.04	8.00	3.45	Tanga.
2.27	1.36	0.86	1.32	2.70	2.41	Pemba (7 yrs.).
2.15	1.36	2.01	3.24	7.44	4.88	Zanzibar.

TABLE XIII

MEAN NUMBER OF RAINDAYS

	<i>Jan.</i>	<i>Feb.</i>	<i>Mar.</i>	<i>April.</i>	<i>May.</i>	<i>June.</i>
Victoria Nyanza District,						
1° N.-3° S. 32° E.-35° E. :						
Mengo (2-3 yrs.)	8.3	9.0	17.5	19.5	15.5	18.0
Entebbe	8.0	8.5	15.3	18.3	17.5	10.9
Kisumu or Port Florence.	5.0	7.0	11.0	16.0	13.0	10.0
Shirati	4.8	7.5	6.2	12.6	9.8	3.6
Bukoba	9.0	9.0	16.0	21.0	15.0	3.0
Rubja (Bukoba)	7.4	6.8	12.8	17.0	12.0	3.2
Neuwied (Ukerewe)	12.0	12.0	15.0	21.0	14.0	5.0
Muansa	7.1	9.0	12.0	14.1]	7.7	1.9
Equatorial Plateau, 1° N.-1½° S.						
35° E.-38° E. :						
Nandi	7.0	9.0	10.0	18.0	17.0	15.0
Eldama Ravine	3.0	10.0	13.0	21.0	18.0	21.0
Naivasha	6.0	5.0	11.5	15.7	12.0	6.3
Fort Hall	4.0	9.6	10.0	23.0	18.0	8.4
Sotik	7.0	13.0	24.0	22.0	20.0	19.0
Limoru	4.0	12.0	10.5	24.0	25.5	17.0
Kikuyu (Fort Smith)	4.7	9.3	13.0	24.0	18.0	6.0
Nairobi	5.4	6.5	11.8	16.8	18.0	8.5
Machakos	4.4	8.0	11.7	18.0	11.0	3.7
South Frontier, 3° S.-5° S.						
36° E.-39° E. :						
Moshi	7.5	6.0	12.0	22.2	20.6	10.8
Arusha	6.7	7.5	10.8	21.2	18.1	6.4
Voi, Taita (2 yrs.)	3.0	7.0	7.0	10.0	5.0	0.0
Mwatate (2 yrs.)	5.0	4.0	2.0	11.0	9.0	5.0
Amani	10.7	6.5	12.0	23.4	20.2	11.7
Coast, 0°-6° S. 39° E.-43½° E. :						
Kismayu	0.5	0.0	0.2	3.3	7.4	8.7
Lamu	0.5	0.5	3.0	13.5	15.0	9.8
Malindi (3-5 yrs.)	1.5	1.5	2.7	12.0	14.0	10.0
Mombasa	4.0	3.0	6.0	13.0	16.0	9.0
Shimoni	3.3	3.0	7.3	12.6	21.0	10.6
Tanga	4.9	5.0	9.4	17.2	16.0	8.0
Pemba	5.4	3.0	7.3	19.0	19.2	7.6
Zanzibar	5.4	3.7	8.3	14.8	12.3	3.4

July. Aug. Sept. Oct. Nov. Dec. Year.

Victoria Nyanza District,

1° N.-3° S. 32° E.-35° E. :

13.5	20.0	15.5	—	23.0	14.0	(174)	Mengo (2-3 yrs.).
7.7	8.2	7.8	11.1	13.6	11.4	138	Entebbe.
7.0	10.0	8.0	9.0	10.0	11.0	117	Kisumu or Port Florence.
3.6	2.0	2.4	6.6	8.4	8.0	76	Shirati.
4.0	7.0	8.0	11.0	17.0	14.0	134	Bukoba.
1.8	4.4	5.4	10.4	13.4	15.4	110	Rubja (Bukoba).
3.0	9.0	7.0	11.0	18.0	18.0	145	Neuwied (Ukerewe).
0.7	2.7	3.0	7.4	11.1	11.6	88	Muansa.

982

Equatorial Plateau, 1° N.-1½° S.

35° E.-38° E. :

15.0	20.0	13.0	13.0	13.0	5.0	155	Nandi.
16.0	17.0	9.0	10.0	18.0	7.0	163	Eldama Ravine.
3.3	6.7	5.7	6.0	7.7	5.7	91	Naivasha.
4.6	8.0	3.0	10.4	16.6	6.2	122	Fort Hall.
8.0	14.0	13.0	10.0	20.0	19.0	189	Sotik.
12.5	15.7	8.0	8.0	20.5	15.0	179	Limoru.
5.0	4.0	3.0	8.0	15.0	11.0	119	Kikuyu (Fort Smith).
4.3	7.5	5.2	6.0	16.0	9.3	115	Nairobi.
2.1	2.7	1.7	6.0	18.4	15.0	103	Machakos.

1236

South Frontier, 3° S.-5° S.

36° E.-39° E. :

9.6	7.4	4.1	5.3	8.7	9.1	123	Moshi.
5.3	4.4	5.3	4.9	10.0	9.6	110	Arusha.
0.0	2.0	3.0	2.0	11.0	14.0	64	Voi, Taita (2 yrs.).
4.0	1.0	4.0	5.0	9.0	6.0	65	Mwatate (2 yrs.).
13.2	12.0	13.4	12.2	14.4	14.6	164	Amani.

526

Coast, 0°-6° S. 39° E.-43½° E. :

7.0	5.6	3.1	0.4	2.3	1.0	39.5	Kismayu.
8.0	7.0	5.5	2.0	3.0	2.5	70.2	Lamu.
9.0	4.2	6.0	5.0	4.0	2.0	72	Malindi (3-5 yrs.).
11.0	10.5	9.5	9.0	10.0	8.0	109	Mombasa.
14.0	12.0	6.0	6.6	10.0	7.0	113	Shimoni.
10.7	12.0	11.5	10.4	14.5	7.8	127	Tanga.
8.1	4.8	2.7	4.8	12.0	10.4	104	Pemba.
5.8	4.2	5.4	5.6	11.4	8.5	88.8	Zanzibar.

723.5

TABLE XIV
CLOUD (SCALE 0-10)

	<i>Jan.</i>	<i>Feb.</i>	<i>Mar.</i>	<i>April.</i>	<i>May.</i>	<i>June.</i>
Victoria Nyanza District,						
1° N.-3° S. 32° E.-35° E. :						
Mengo (2-3 yrs.)	6.6	5.8	7.2	7.2	6.4	8.4
Entebbe	4.7	4.6	4.8	5.0	5.2	4.8
Bukoba	4.0	4.4	4.6	4.9	4.8	3.9
Rubja (Bukoba)	5.0	5.2	6.1	6.3	5.0	3.7
Neuwied (Ukerewe)	7.4	7.5	7.6	8.3	7.0	6.2
Muansa	3.5	4.2	4.4	4.8	3.3	2.1
Equatorial Plateau, 1° N.-1½° S.						
35° E.-38° E. :						
Nandi, 9 a.m.	0.8	2.9	3.3	3.1	5.3	3.0
Eldama Ravine, 9 a.m.	1.3	1.7	3.1	3.0	3.0	2.7
Fort Hall	3.6	3.8	4.3	4.8	3.9	3.4
Kikuyu, 9 a.m. (2 yrs.)	5.1	4.3	4.7	6.4	6.2	6.8
Nairobi	3.9	4.7	4.0	7.8	6.3	5.8
Machakos, 9 a.m.	3.8	4.8	4.6	5.9	5.7	5.8
South Frontier, 3° S.-5° S.						
36° E.-39° E. :						
Moshi	4.2	4.4	5.7	7.3	7.8	7.2
Arusha	3.6	4.2	4.6	6.3	6.8	6.2
Amani	5.9	5.9	6.1	7.5	6.4	6.4
Coast, 0°-6° S. 39° E.-43½° E. :						
Mombasa, 9 a.m.	4.0	4.0	4.0	5.0	6.0	5.0
Tanga	3.9	3.9	4.0	5.5	6.1	4.3
Zanzibar, 8 a.m.	6.6	6.5	6.0	6.9	6.7	5.3

July. Aug. Sept. Oct. Nov. Dec. Year.

**Victoria Nyanza District,
1° N.-3° S. 32° E.-35° E. :**

6.8	7.1	6.6	7.7	7.3	5.5	6.9	Mengo (2-3 yrs.).
5.1	5.4	5.0	4.8	4.7	4.4	4.9	Entebbe.
3.7	3.9	5.0	5.4	5.3	4.0	4.6	Bukoba.
4.3	5.6	5.0	6.0	6.3	6.1	5.4	Rubja (Bukoba).
6.0	6.0	6.5	7.8	8.0	6.8	7.1	Neuwied (Ukerewe).
1.7	2.4	2.7	3.4	4.1	3.7	3.4	Muansa.

**Equatorial Plateau, 1° N.-1½° S.
35° E.-38° E. :**

3.5	4.4	1.3	1.1	1.3	—	—	Nandi, 9 a.m.
3.5	2.9	1.7	2.2	3.1	2.1	2.5	Eldama Ravine, 9 a.m.
3.5	3.4	1.2	3.2	4.1	4.1	3.6	Fort Hall.
7.9	6.6	6.4	6.3	6.8	4.3	6.0	Kikuyu, 9 a.m. (2 yrs.).
7.1	7.9	6.5	6.3	7.4	7.1	6.2	Nairobi.
6.1	6.1	5.1	4.9	6.2	4.8	5.3	Machakos, 9 a.m.

**South Frontier, 3° S.-5° S.
36° E.-39° E. :**

7.1	6.5	5.7	4.6	5.1	4.6	5.8	Moshi.
5.6	5.4	5.3	4.5	5.5	4.7	5.2	Arusha.
7.1	6.9	6.3	5.8	6.2	5.9	6.2	Amani.

Coast, 0°-6° S. 39° E.-43½° E.

5.0	5.0	4.0	4.0	5.0	4.0	4.6	Mombasa, 9 a.m.
4.6	4.9	4.2	3.7	4.5	3.7	4.4	Tanga.
6.0	6.3	6.1	6.2	6.1	5.9	6.2	Zanzibar, 8 a.m.

TABLE XV
RELATIVE HUMIDITY

	<i>Jan.</i> %	<i>Feb.</i> %	<i>Mar.</i> %	<i>April.</i> %	<i>May.</i> %	<i>June.</i> %
Victoria Nyanza District, 1° N.-3° S. 32° E.-35° E. :						
Bukoba	79	78	83	89	82	76
Rubja (Bukoba)	76	75	79	85	81	69
Neuwied (Ukerewe)	75	76	75	81	75	67
Muansa	77	75	78	81	77	68
Equatorial Plateau, 1° N.-1½° S. 35° E.-38° E. :						
Machakos, 9 a.m.	71	74	78	80	78	77
South Frontier, 3° S.-5° S. 36° E.-39° E. :						
Moshi	66	65	70	81	83	76
Amani	84	81	84	90	89	86
Coast, 0°-6° S. 39° E.-43½° E. :						
Lamu, 9 a.m. (3 yrs.)	94	92	92	91	93	90
Malindi, 9 a.m. (3 yrs.)	83	85	80	88	90	86
Mombasa	78	81	83	89	86	85
Shimoni, 9 a.m.	89	85	91	92	91	92
Tanga	80	80	80	86	85	81
Zanzibar	81	79	82	87	86	84

TABLE XVI
MEAN NUMBER OF DAYS OF HAIL

	<i>Jan.</i>	<i>Feb.</i>	<i>Mar.</i>	<i>April.</i>	<i>May.</i>	<i>June.</i>
Equatorial Plateau, 1° N.-1½° S. 35° E.-38° E. :						
Nandi	0.5	1.0	0.5	2.5	0.0	0.5
Eldama Ravine	0.0	2.0	0.0	0.0	0.0	0.0
Sotik (2 yrs.)	0.0	0.5	1.5	0.0	0.5	0.5
Kikuyu	0.0	0.0	0.0	1.0	0.0	0.0

<i>July.</i> %	<i>Aug.</i> %	<i>Sept.</i> %	<i>Oct.</i> %	<i>Nov.</i> %	<i>Dec.</i> %	<i>Year.</i> %	
							Victoria Nyanza District, 1° N.-3° S. 32° E.-35° E. :
71	77	79	80	82	80	80	Bukoba.
69	74	75	77	80	81	77	Rubja (Bukoba).
64	71	68	71	75	77	73	Neuwied (Ukerewe).
65	70	69	72	78	80	74	Muansa.
							Equatorial Plateau, 1° N.-1½° S. : 35° E.-38° E. :
75	75	74	77	82	78	77	Machakos, 9 a.m.
							South Frontier. 3° S.-5° S. 36° E.-39° E. :
74	78	70	66	69	68	72	Moshi.
87	90	88	88	89	87	87	Amani.
							Coast, 0°-6° S. 39° E.-43½° E. :
90	85	86	90	86	91	90	Lamu, 9 a.m. (3 yrs.).
87	85	82	78	84	85	84	Malindi 9 a.m. (3 yrs.).
85	83	81	80	76	74	82	Mombasa.
94	94	93	92	93	92	91	Shimoni, 9 a.m.
84	83	83	81	84	82	82	Tanga.
86	85	83	82	82	82	83	Zanzibar.
<i>July.</i>	<i>Aug.</i>	<i>Sept.</i>	<i>Oct.</i>	<i>Nov.</i>	<i>Dec.</i>	<i>Year.</i>	
							Equatorial Plateau, 1° N.-1½° S. 35° E.-38° E. :
0-0	0-5	1-5	0-0	0-0	0-0	7-0	Nandi.
0-0	0-0	0-0	0-0	0-0	0-0	2-0	Eldama Ravine.
0-0	1-0	0-0	0-0	0-0	0-0	4-0	Sotik (2 yrs.).
0-0	0-0	0-0	0-0	0-0	0-0	1-0	Kikuyu.

TABLE XVII
MEAN NUMBER OF HOURS OF SUNSHINE

			h.m.	h.m.	h.m.	h.m.	h.m.	h.m.
Entebbe (10 yrs.)	.	.	6.55	6.07	5.55	4.46	5.01	5.72
Neuwied (9 yrs.)	.	.	7.31	7.17	8.00	7.16	8.46	8.48
Muansa (1 yr.)	.	.	6.17	6.14	7.56	7.00	6.29	8.16
Amani (5-6 yrs.)	.	.	7.02	7.35	6.49	4.02	4.38	5.52

TABLE XVIII
MEAN NUMBER OF DAYS OF THUNDERSTORMS

	<i>Jan.</i>	<i>Feb.</i>	<i>Mar.</i>	<i>April.</i>	<i>May.</i>	<i>June.</i>
Victoria Nyanza District,						
1° N.-3° S. 32° E.-35° E. :						
Entebbe	1.7	2.1	2.8	3.8	1.8	1.9
Bukoba	6.0	7.0	12.0	10.0	8.0	4.0
Rubja (Bukoba)	11.2	10.2	13.8	13.5	12.5	5.2
Neuwied (Ukerewe)	9	8	11	11	8	4
Muansa	3.9	4.5	6.0	6.9	4.1	1.5
Equatorial Plateau, 1° N.-1½° S.						
35° E.-38° E. :						
Nandi	0.0	6.0	5.25	8.0	3.0	2.5
Eldama Ravine	2.0	9.0	7.0	14.0	14.0	13.0
Naivasha	0.0	9.0	5.0	1.0	8.0	0.0
Fort Hall	0.5	0.5	0.0	7.0	1.8	0.0
Sotik (3 yrs.)	8.0	12.0	26.0	29.0	22.0	25.0
Kikuyu	0.0	0.0	1.0	0.0	0.0	3.0
Machakos	0.8	4.3	2.0	9.0	1.7	0.3
South Frontier, 3° S.-5° S.						
36° E.-39° E. :						
Moshi	3.0	3.0	6.0	4.0	0.5	0.2
Arusha	4.0	3.8	6.2	4.3	1.5	0.5
Mwatate (2 yrs.)	0.5	1.5	1.0	6.5	0.0	0.0
Amani	5.8	3.0	3.7	1.7	0.0	0.0
Coast, 0°-6° S. 39° E.-43½° E. :						
Mombasa (6 yrs.)	1.5	0.3	0.5	2.7	1.1	0.0

<i>h.m.</i>	<i>h.m.</i>	<i>h.m.</i>	<i>h.m.</i>	<i>h.m.</i>	<i>h.m.</i>	<i>h.m.</i>	
5.60	5.91	6.22	6.05	5.83	5.87	5.47	Entebbe (10 yrs.).
8.33	7.32	8.18	7.52	7.15	6.46	7.50	Neuwied (9 yrs.).
9.28	8.31	8.26	7.33	7.23	5.55	7.27	Muansa (1 yr.).
4.45	4.23	4.43	5.50	6.18	6.40	5.43	Amani (5-6 yrs.).

July. Aug. Sept. Oct. Nov. Dec. Year.

**Victoria Nyanza District,
1° N.-3° S. 32° E.-35° E. :**

1.1	1.4	1.1	1.0	2.4	2.6	23.7	Entebbe.
4.0	5.0	8.0	11.0	12.0	8.0	95	Bukoba.
5.2	9.2	5.2	11.0	12.8	11.8	121.5	Rubja (Bukoba).
3	7	6	9	12	10	98	Neuwied (Ukerewe).
0.5	0.9	1.4	3.7	5.8	5.3	44.5	Muansa.

**Equatorial Plateau, 1° N.-1½° S.
35° E.-38° E. :**

6.5	4.25	3.0	4.5	4.25	3.25	49.5	Nandi.
14.0	15.0	7.0	9.0	10.0	2.0	116	Eldama Ravine.
0.0	11.0	16.0	14.0	8.0	4.5	76.5	Naivasha.
0.0	0.8	0.0	2.5	0.8	0.2	14.1	Fort Hall.
8.0	16.0	15.0	15.0	19.0	19.0	214	Sotik (3 yrs.).
0.0	2.0	3.0	0.0	0.0	0.0	9	Kikuyu.
0.0	1.0	0.5	1.7	2.5	3.1	26.9	Machakos.

**South Frontier, 3° S.-5° S.
36° E.-39° E. :**

0.0	0.0	0.5	0.3	5.0	4.0	26.5	Moshi.
0.0	0.5	0.0	0.7	5.0	5.0	31.5	Arusha.
0.0	0.0	0.0	0.0	2.0	1.5	13	Mwatate (2 yrs.).
0.0	0.0	0.0	0.3	2.0	3.8	20.3	Amani.

Coast, 0°-6° S. 39° E.-43½° E. :

0.0	0.1	0.3	0.0	0.1	2.1	8.7	Mombasa (6 yrs.).
-----	-----	-----	-----	-----	-----	-----	-------------------

TABLE XIX
MEAN WIND FORCE (0-10)

	<i>Jan.</i>	<i>Feb.</i>	<i>Mar.</i>	<i>April.</i>	<i>May.</i>	<i>June.</i>
Victoria Nyanza District,						
1° N.-3° S. 32° E.-35° E. :						
Entebbe	1.3	1.4	1.4	1.4	1.3	1.3
Bukoba	1.8	2.3	2.3	1.9	2.1	1.9
Rubja (Bukoba)	1.5	1.8	2.1	1.9	1.8	2.2
Neuwied (Ukerewe)	2.0	2.2	2.2	2.0	2.3	2.5
Muansa	1.9	2.3	2.0	2.1	1.9	1.8
Equatorial Plateau, 1° N.-1½° S.						
35° E.-38° E. :						
Eldama Ravine (9 a.m.)	2.3	1.1	2.5	1.9	2.4	2.1
Naivasha	1.2	0.6	0.5	0.8	1.8	1.3
Fort Hall	2.2	1.4	1.5	1.0	2.4	1.2
Kikuyu (9 a.m.)	2.1	1.9	2.5	2.1	2.0	1.7
Nairobi (9 a.m.)	1.8	1.8	2.0	1.8	1.4	2.5
Machakos (9 a.m.)	1.4	1.3	1.3	1.5	1.6	1.9
South Frontier, 3° S.-5° S.						
36° E.-39° E.						
Moshi	1.7	2.0	2.3	1.8	1.7	1.5
Arusha	1.0	1.1	1.2	1.3	1.5	1.2
Amani	2.1	2.1	1.8	1.7	2.0	2.1
Coast, 0°-6° S. 39° E.-43½° E. :						
Mombasa (9 a.m.)	2.5	2.3	2.4	2.9	3.1	3.2
Tanga	2.8	2.7	2.1	2.1	2.3	2.6

July. Aug. Sept. Oct. Nov. Dec. Year.

**Victoria Nyanza District,
1° N.-3° S. 32° E.-35° E. :**

1.3	1.4	1.4	1.5	1.4	1.4	1.4	Entebbe.
1.8	1.9	1.7	1.8	2.0	2.0	1.9	Bukoba.
1.9	1.8	2.5	1.8	1.5	1.7	1.9	Rubja (Bukoba).
2.6	2.4	2.5	2.3	2.0	2.1	2.2	Neuwied (Ukerewe).
1.9	1.8	1.9	2.1	1.8	1.8	1.9	Muansa.

**Equatorial Plateau, 1° N.-1½° S.
35° E.-38° E. :**

2.2	2.1	2.2	1.7	2.3	2.8	2.1	Eldama Ravine (9 a.m.).
1.2	1.3	1.8	1.9	1.6	1.5	1.3	Naivasha.
1.2	1.0	1.5	2.1	2.0	2.0	1.6	Fort Hall.
2.3	1.9	1.8	2.1	2.3	2.7	2.1	Kikuyu (9 a.m.).
1.8	1.5	1.7	2.1	2.3	2.3	1.9	Nairobi (9 a.m.).
1.8	1.6	1.8	1.8	1.7	1.7	1.6	Machakos (9 a.m.).

**South Frontier, 3° S.-5° S.
36° E.-39° E. :**

1.7	2.2	2.8	2.8	2.8	2.2	2.0	Moshi.
1.4	1.7	1.8	2.0	1.3	1.1	1.4	Arusha.
2.0	1.8	1.6	1.7	1.6	1.9	1.9	Amani.

Coast, 0°-6° S. 39° E.-43½° E. :

3.7	3.1	3.2	2.5	2.2	2.4	2.7	Mombasa.
2.3	2.3	2.2	2.3	2.2	2.7	2.4	Tanga.

TABLE XX

WIND DIRECTIONS. PERCENTAGE OF OBSERVATIONS

JANUARY

	N.	NE.	E.	SE.	S.	SW.	W.	NW.
Victoria Nyanza District,								
1° N.-3° S. 32° E.-35° E. :								
Mengo . . .	2	5	2	5	5	0	3	21
Entebbe . . .	4	0	3	0	14	15	12	0
Bukoba . . .	6	5	24	15	9	7	9	4
Rubja (Bukoba) . . .	6	6	22	13	9	8	9	2
Muansa . . .	5	4	9	11	14	10	10	9
Equatorial Plateau,								
1° N.-1½° S. 35° E.-38° E. :								
Eldama Ravine . . .	0	3	91	3	0	0	0	0
Naivasha . . .	0	0	0	0	16	0	13	43
Fort Hall . . .	0	0	100	0	0	0	0	0
Kikuyu (Fort Smith) . . .	10	84	6	0	0	0	0	0
Nairobi . . .	26	52	13	0	0	0	0	0
Machakos . . .	7	39	39	3	3	3	0	0
Southern Frontier,								
3° S.-5° S. 36° E.-39° E. :								
Moshi . . .	15	13	15	9	9	6	10	6
Arusha . . .	4	14	36	4	3	2	2	1
Amani . . .	8	27	16	12	6	6	6	11
Coast, 0°-6° S.								
39° E.-43½° E. :								
Mombasa . . .	29	16	7	3	0	0	0	39
Tanga . . .	19	45	13	11	3	2	1	4
Zanzibar . . .	45	36	5	2	3	3	1	2

FEBRUARY

	N.	NE.	E.	SE.	S.	SW.	W.	NW.	C.
Victoria Nyanza District,									
1° N.-3° S. 32° E.-35° E. :									
Mengo . . .	9	5	0	2	7	2	0	12	63
Entebbe . . .	3	0	5	0	13	13	11	1	54
Bukoba . . .	4	5	23	13	13	10	10	5	17
Rubja . . .	0.5	7	22	16	10	17	9	6	12.5
Muansa . . .	3	2	10	13	16	12	13	12	20
Equatorial Plateau,									
1° N.-1½° S. 35° E.-38° E. :									
Eldama Ravine . . .	0	0	89	0	0	0	0	0	11
Naivasha . . .	0	0	0	4	7	0	0	32	57
Fort Hall . . .	0	0	100	0	0	0	0	0	0
Kikuyu . . .	0	58	34	2	0	0	6	0	0
Nairobi	insufficient records								
Machakos . . .	7	43	36	4	4	0	0	0	7
South Frontier,									
3° S.-5° S. 36° E.-39° E. :									
Moshi . . .	15	17	17	9	8	5	7	7	14
Arusha . . .	4	6	31	4	3	1	2	1	48
Amani . . .	8	23	22	15	5	4	7	10	6
Coast, 0°-6° S.									
39° E.-43½° E. :									
Mombasa . . .	7	29	4	11	0	4	0	32	14
Tanga . . .	21	41	18	8	3	0	1	6	2
Zanzibar . . .	37	37	5	5	4	4	2	2	4

TABLE XX (*continued*)

WIND DIRECTIONS. PERCENTAGE OF OBSERVATIONS

MARCH

	N.	NE.	E.	SE.	S.	SW.	W.	NW.
Victoria Nyanza District,								
1° N.-3° S. 32° E.-35° E. :								
Mengo . . .	3	0	0	3	29	0	0	0
Entebbe . . .	3	0	4	0	12	17	11	0
Bukoba . . .	4	5	22	12	18	10	12	4
Rubja . . .	3	10	19	9	13	14	15	6
Muansa . . .	3	4	4	17	16	15	8	14
Equatorial Plateau,								
1° N.-1½° S. 35° E.-38° E. :								
Eldama Ravine . . .	0	0	87	0	0	3	0	0
Naivasha . . .	0	0	0	0	0	0	0	19
Fort Hall . . .	0	0	100	0	0	0	0	0
Kikuyu . . .	3	72	13	2	2	0	5	1.5
Nairobi . . .	3	58	29	3	0	0	0	0
Machakos . . .	13	39	26	7	3	0	0	0
South Frontier,								
3° S.-5° S. 36° E.-39° E. :								
Moshi . . .	10	17	24	12	7	4	7	5
Arusha . . .	4	4	37	8	2	1	1	0
Amani . . .	5	17	21	22	8	7	7	8
Coast, 0°-6° S.								
39° E.-43½° E. :								
Mombasa . . .	10	26	6	23	13	3	0	19
Tanga . . .	9	20	21	12	17	6	4	5
Zanzibar . . .	17	23	12	7	12	16	2	2

APRIL

	N.	NE.	E.	SE.	S.	SW.	W.	NW.	C.
Victoria Nyanza District, 1° N.-3° S. 32° E.-35° E. :									
Mengo . . .	2	0	0	10	33	0	2	5	48
Entebbe . . .	2	0	2	1	16	12	17	1	49
Bukoba . . .	5	4	24	13	17	7	7	3	20
Rubja . . .	5	7	24	12	18	7.5	6	4.5	16
Muansa . . .	2	2	6	16	18	18	7	12	18
Equatorial Plateau, 1° N.-1½° S. 35° E.-38° E. :									
Eldama Ravine . . .	3	3	78	0	0	3	0	3	10
Naivasha . . .	0	0	0	4	51	0	0	0	45
Fort Hall . . .	0	2	98	0	0	0	0	0	0
Kikuyu . . .	5	33	23	7	0	0	22	3	7
Nairobi . . .	6	28	23	6	3	6	6	6	16
Machakos . . .	7	16	43	16	5	0	0	0	13
South Frontier, 3° S.-5° S. 36° E.-39° E. :									
Moshi . . .	10	13	24	14	10	5	3	4	17
Arusha . . .	0	10	40	6	3	0	0	0	41
Amani . . .	1	7	9	35	18	15	9	3	3
Coast, 0°-6° E. 39° E.-43½° E. :									
Mombasa . . .	0	3	3	23	7	33	20	10	0
Tanga . . .	0	2	7	37	36	14	2	0	0
Zanzibar . . .	1	2	0	4	40	37	7	1	8

TABLE XX (*continued*)

WIND DIRECTIONS. PERCENTAGE OF OBSERVATIONS

MAY

	N.	NE.	E.	SE.	S.	SW.	W.	NW.
Victoria Nyanza District,								
1° N.-3° S. 32° E.-35° E. :								
Mengo . . .	16	0	0	5	15	0	0	0
Entebbe . . .	2	0	2	1	19	12	17	1
Bukoba . . .	1	3	26	15	24	7	4	0
Rubja . . .	1	5.5	26	12	19.5	12.5	4	0.5
Muansa . . .	3	3	8	23	13	12	6	9
Equatorial Plateau,								
1° N.-1½° S. 35° E.-38° E. :								
Eldama Ravine . . .	0	3	85	6	0	0	3	0
Naivasha . . .	0	0	0	0	3	94	3	0
Fort Hall . . .	0	0	100	0	0	0	0	0
Kikuyu . . .	0	23	11	45	13	3	2	0
Nairobi . . .	6	6	13	3	19	21	10	6
Machakos . . .	10	26	32	19	0	0	3	0
South Frontier,								
3° S.-5° S. 36° E.-39° E. :								
Moshi . . .	4	12	21	15	19	7	4	2
Arusha . . .	1	17	41	12	4	0	0	0
Amani . . .	0	1	4	45	22	16	5	1
Coast, 0°-6° S.								
39° E.-43½° E. :								
Mombasa . . .	0	0	0	0	6	84	10	0
Tanga . . .	0	0	0	23	54	18	2	0
Zanzibar . . .	0	0	0	2	56	37	1	0

JUNE

	N.	NE.	E.	SE.	S.	SW.	W.	NW.	C.
Victoria Nyanza District,									
1° N.-3° S. 32° E.-35° E. :									
Mengo . . .	8	0	2	7	5	0	0	5	73
Entebbe . . .	2	0	4	1	20	10	16	1	46
Bukoba . . .	2	2	21	20	27	5	3	2	17
Rubja . . .	1	4.5	16	23	28	1.5	5	1	20
Muansa . . .	2	1	8	23	14	15	8	10	19
Equatorial Plateau,									
1° N.-1½° S. 35° E.-38° E. :									
Eldama Ravine . . .	0	0	90	7	0	0	0	0	3
Naivasha . . .	0	0	0	0	0	100	0	0	0
Fort Hall . . .	0	0	75	25	0	0	0	0	0
Kikuyu . . .	3	7	17	30	13	8	7	13	2
Nairobi . . .	7	10	7	13	27	26	3	0	7
Machakos . . .	3	13	27	33	3	3	7	0	10
South Frontier,									
3° S.-5° S. 36° E.-39° E. :									
Moshi . . .	2	14	18	15	12	9	5	2	22
Arusha . . .	1	9	59	3	1	0	0	0	26
Amani . . .	0	1	2	51	25	12	3	0	6
Coast, 0°-6° S.									
39° E.-43½° E. :									
Mombasa . . .	0	0	0	0	7	80	13	0	0
Tanga . . .	0	0	0	30	47	21	2	0	0
Zanzibar . . .	0	0	0	3	40	48	7	1	1

TABLE XX (*continued*)

WIND DIRECTIONS. PERCENTAGE OF OBSERVATIONS

JULY

	N.	NE.	E.	SE.	S.	SW.	W.	NW.	C.
Victoria Nyanza District,									
1° N.-3° S. 32° E.-35° E. :									
Mengo . . .	8	3	0	8	5	7	0	8	61
Entebbe . . .	2	0	7	1	17	11	15	1	46
Bukoba . . .	1	4	27	22	19	5	2	1	19
Rubja . . .	1	4	31	18	16	4	3.5	0	22.5
Muansa . . .	3	1	8	18	19	12	10	8	22
Equatorial Plateau,									
1° N.-1½° S. 35° E.-38° E. :									
Eldama Ravine . . .	0	3	79	6	6	0	3	0	3
Naivasha . . .	0	0	0	0	7	90	3	0	0
Fort Hall . . .	0	0	50	0	50	0	0	0	0
Kikuyu . . .	0	3	21	39	14.5	13	1.5	7.0	1.5
Nairobi . . .	3	7	3	3	16	42	19	0	7
Machakos . . .	7	13	29	29	0	0	7	3	13
South Frontier,									
3° S.-5° S. 36° E.-39° E. :									
Moshi . . .	5	14	18	13	16	6	3	1	24
Arusha . . .	3	17	60	4	0	0	0	0	16
Amani . . .	0	1	7	42	28	12	1	0	8
Coast, 0°-6° S.									
39° E.-43½° E. :									
Mombasa . . .	0	0	0	3	10	84	3	0	0
Tanga . . .	0	0	0	42	46	11	1	0	0
Zanzibar . . .	0	0	0	4	43	45	1	0	2

• AUGUST

	N.	NE.	E.	SE.	S.	SW.	W.	NW.	C.
Victoria Nyanza District,									
1° N.-3° S. 32° E.-35° E. :									
Mengo . . .	10	8	0	0	3	3	0	7	69
Entebbe . . .	2	1	5	1	15	13	19	1	43
Bukoba . . .	6	5	26	18	10	2	3	6	24
Rubja . . .	0.5	8.5	21.5	18	7.5	2	3	6	33
Muansa . . .	6	2	7	17	15	8	9	13	25
Equatorial Plateau,									
1° N.-1½° S. 35° E.-38° E. :									
Eldama Ravine . .	10	3	78	3	3	0	3	0	0
Naivasha . . .	0	0	0	0	3	78	19	0	0
Fort Hall . . .	0	0	74	26	0	0	0	0	0
Kikuyu . . .	0	0	26	46	8	8	2	7	3
Nairobi . . .	0	3	13	7	26	32	6	3	10
Machakos . . .	10	13	32	32	0	0	3	0	10
South Frontier,									
3° S.-5° S. 36° E.-39° E. :									
Moshi . . .	3	16	22	13	16	5	3	1	20
Arusha . . .	0	8	62	10	3	0	0	0	17
Amani . . .	1	2	8	41	23	9	2	1	14
Coast, 0°-6° S.									
39° E.-43½° E. :									
Mombasa . . .	0	0	0	6	36	55	3	0	0
Tanga . . .	0	0	0	39	48	11	1	0	0
Zanzibar . . .	0	0	1	10	41	38	4	0	6

TABLE XX (*continued*)

WIND DIRECTIONS. PERCENTAGE OF OBSERVATIONS

SEPTEMBER

	N.	NE.	E.	SE.	S.	SW.	W.	NW.	C.
Victoria Nyanza District,									
1° N.-3° S. 32° E.-35° E. :									
Mengo . . .	3	3	0	3	7	10	0	2	72
Entebbe . . .	3	0	6	1	17	12	20	0	41
Bukoba . . .	8	3	18	15	14	4	11	6	21
Rubja . . .	4	6.5	23	17	11	6	12	4	16.5
Muansa . . .	8	5	7	17	11	8	8	14	22
Equatorial Plateau,									
1° N.-1½° S. 35° E.-38° E. :									
Eldama Ravine . . .	10	3	74	0	3	0	3	0	7
Naivasha . . .	0	0	0	7	90	0	3	0	0
Fort Hall . . .	0	0	100	0	0	0	0	0	0
Kikuyu . . .	2	5	32	48	10	2	0	0	2
Nairobi . . .	3	37	7	10	10	33	0	0	0
Machakos . . .	10	10	50	23	0	0	0	0	7
South Frontier,									
3° S.-5° S. 36° E.-39° E. :									
Moshi . . .	2	23	21	18	13	4	2	1	15
Arusha . . .	0	4	71	10	3	0	0	0	12
Amani . . .	0	2	14	41	18	7	3	1	13
Coast, 0°-6° S.									
39° E.-43½° E. :									
Mombasa . . .	0	0	0	10	40	47	3	0	0
Tanga . . .	0	0	1	45	37	12	2	0	3
Zanzibar . . .	0	0	1	23	38	26	4	0	8

OCTOBER

	N.	NE.	E.	SE.	S.	SW.	W.	NW.	C.
Victoria Nyanza District,									
1° N.-3° S. 32° E.-35° E. :									
Mengo . . .	48	13	0	0	0	0	3	0	36
Entebbe . . .	3	0	6	2	15	14	19	0	41
Bukoba . . .	10	9	24	11	4	4	15	7	16
Rubja . . .	1	6.5	24	14	4	7	17	7	19.5
Muansa . . .	8	3	7	10	11	10	13	17	22
Equatorial Plateau,									
1° N.-1½° S. 35° E.-38° E. :									
Eldama Ravine . . .	6	3	76	3	6	3	3	0	0
Naivasha . . .	0	3	0	16	81	0	0	0	0
Fort Hall . . .	0	0	74	0	26	0	0	0	0
Kikuyu . . .	6.5	11	40.5	35.5	0	0	0	0	6.5
Nairobi . . .	3	42	36	10	3	0	0	0	6
Machakos . . .	10	10	58	16	0	0	0	0	7
South Frontier,									
3° S.-5° S. 36° E.-39° E. :									
Moshi . . .	2	19	31	20	11	3	3	2	10
Arusha . . .	0	2	74	5	2	0	0	0	17
Amani . . .	0	4	19	35	13	7	4	3	15
Coast, 0°-6° S.									
39° E.-43½° E. :									
Mombasa . . .	0	0	3	42	23	23	3	0	6
Tanga . . .	0	0	3	55	31	6	3	1	1
Zanzibar . . .	0	1	5	39	27	13	2	0	13

TABLE XX (*continued*)

WIND DIRECTIONS. PERCENTAGE OF OBSERVATIONS

NOVEMBER

	N.	NE.	E.	SE.	S.	SW.	W.	NW.	C.
Victoria Nyanza District,									
1° N.-3° S. 32° E.-35° E. :									
Mengo . . .	10	4	0	1	4	4	2	6	68
Entebbe . . .	4	0	3	1	15	16	17	0	44
Bukoba . . .	9	6	23	13	3	2	12	8	25
Rubja . . .	5	4	26	8	4	5	19	7	22
Muansa . . .	10	5	3	11	10	12	10	16	24
Equatorial Plateau,									
1° N.-1½° S. 35° E.-38° E. :									
Eldama Ravine . . .	7	0	70	3	10	0	10	0	0
Naivasha . . .	0	3	19	29	33	6	10	0	0
Fort Hall . . .	0	0	50	0	50	0	0	0	0
Kikuyu . . .	8	12	55	17	0	0	0	3	5
Nairobi . . .	10	43	30	7	0	0	3	3	4
Machakos . . .	0	6	47	47	0	0	0	0	0
South Frontier,									
3° S.-5° S. 36° E.-39° E. :									
Moshi . . .	5	22	26	15	10	5	4	4	8
Arusha . . .	1	2	58	3	1	0	1	1	33
Amani . . .	5	11	24	24	8	6	4	4	14
Coast, 0°-6° S.									
39° E.-43½° E. :									
Mombasa . . .	3	7	7	35	6	18	4	10	10
Tanga . . .	3	12	10	46	17	3	3	3	3
Zanzibar . . .	4	12	12	30	15	8	1	1	15

DECEMBER

	N.	NE.	E.	SE.	S.	SW.	W.	NW.	C.
Victoria Nyanza District,									
1° N.-3° S. 32° E.-35° E. :									
Mengo . . .	1	7	1	9	2	4	1	4	71
Entebbe . . .	5	0	5	0	13	16	17	0	44
Bukoba . . .	9	7	24	10	5	3	11	8	22
Rubja . . .	5	4	19	8.5	5	4.5	19.5	11.5	23
Muansa . . .	13	4	6	8	14	12	10	13	19
Equatorial Plateau,									
1° N.-1½° S. 35° E.-38° E. :									
Eldama Ravine . . .	6	10	74	10	0	0	0	0	0
Naivasha . . .	0	7	3	13	7	48	10	6	6
Fort Hall . . .	0	0	71	0	29	0	0	0	0
Kikuyu . . .	3	35	52	8	0	0	0	0	2
Nairobi . . .	21	26	39	3	0	0	3	0	7
Machakos . . .	7	35	42	13	0	0	0	0	3
South Frontier,									
3° S.-5° S. 36° E.-39° E. :									
Moshi . . .	12	15	15	10	6	6	11	7	18
Arusha . . .	1	4	50	4	2	1	1	1	37
Amani . . .	10	18	17	19	5	4	7	8	13
Coast, 0°-6° S.									
39° E.-43½° E. :									
Mombasa . . .	29	23	10	3	3	0	0	26	7
Tanga . . .	12	30	24	20	3	3	2	5	1
Zanzibar . . .	30	37	10	7	3	3	1	1	8

TABLE XXI.

SEASONAL WINDS AT HOURS OF OBSERVATION. PERCENTAGE OF OBSERVATIONS

(a) ENTEBBE

	N.	NE.	E.	SE.	S.	SW.	W.	NW.	C.
7 a.m. :									
Dec. Jan. Feb. .	4.4	0.1	5.6	0.0	11.5	8.0	14.9	0.2	54.7
Mar. April, May .	1.4	0.0	3.4	0.3	15.6	5.1	17.3	1.5	55.4
June, July, Aug. .	3.3	0.4	7.9	0.4	16.8	8.4	17.8	1.2	43.8
Sept. Oct. Nov. .	4.9	0.1	8.4	1.4	17.1	6.1	17.0	0.3	44.7
<i>Mean of Year</i> .	3.5	0.1	6.3	0.5	15.2	6.9	16.8	0.8	49.9
2 p.m. :									
Dec. Jan. Feb. .	6.8	0.0	6.7	0.1	24.8	33.1	18.8	0.5	9.1
Mar. April, May .	4.4	0.0	4.6	0.6	25.2	33.7	19.7	0.6	11.2
June, July, Aug. .	1.8	0.5	7.3	2.6	28.0	23.8	23.7	1.9	10.5
Sept. Oct. Nov. .	3.6	0.0	6.3	2.4	23.0	28.7	28.6	0.1	7.3
<i>Mean of Year</i> .	4.2	0.1	6.2	1.4	25.2	29.8	22.7	0.8	9.5
9 p.m. :									
Dec. Jan. Feb. .	0.7	0.0	0.9	0.0	4.6	5.5	6.0	0.2	82.1
Mar. April, May .	0.3	0.0	0.6	0.3	6.4	2.1	7.5	0.0	82.9
June, July, Aug. .	1.2	0.0	1.3	0.0	7.3	2.3	8.5	0.2	79.6
Sept. Oct. Nov. .	1.7	0.0	0.8	0.1	7.7	6.6	10.5	0.1	72.4
<i>Mean of Year</i> .	1.0	0.0	0.9	0.1	6.5	4.1	8.1	0.1	79.2
Mean of the Day :									
Dec. Jan. Feb. .	4.0	0.0	4.4	0.0	13.6	15.5	13.2	0.3	48.6
Mar. April, May .	2.0	0.0	2.9	0.4	15.7	13.6	14.8	0.7	49.9
June, July, Aug. .	2.1	0.3	5.5	1.0	17.5	11.5	16.6	1.1	44.6
Sept. Oct. Nov. .	3.4	0.0	5.2	1.3	15.9	13.8	18.7	0.2	41.5
<i>Mean of Year</i> .	2.9	0.1	4.5	0.7	15.7	13.6	15.8	0.6	46.1

(b) BUKOBA

	N.	NE.	E.	SE.	S.	SW.	W.	NW.	C.
7 a.m. :									
Dec. Jan. Feb. .	7	4	20	13	16	8	7	4	21
Mar. April, May .	3	4	18	15	29	9	5	2	15
June, July, Aug. .	1	2	17	20	37	5	2	5	11
Sept. Oct. Nov. .	10	6	19	12	8	4	9	8	24
<i>Mean of Year</i> .	5	4	18.5	15	22.5	6.5	6	5	17.5
2 p.m. :									
Dec. Jan. Feb. .	7	8	45	18	4	4	4	5	5
Mar. April, May .	3	7	44	20	10	4	4	3	5
June, July, Aug. .	1	6	48	33	7	0	0	2	3
Sept. Oct. Nov. .	7	8	44	20	9	2	3	3	4
<i>Mean of Year</i> .	4.5	7.5	45	23	7.5	2.5	2.5	3	4
9 p.m. :									
Dec. Jan. Feb. .	5	6	6	7	6	7	20	7	36
Mar. April, May .	4	1	10	4	21	12	13	2	33
June, July, Aug. .	6	3	9	8	13	7	5	3	46
Sept. Oct. Nov. .	11	4	6	8	3	4	24	10	30
<i>Mean of Year</i> .	6.5	3.5	8	7	11	7.5	15.5	5.5	36
Mean of the Day :									
Dec. Jan. Feb. .	6	5	23	14	8	6	11	6	21
Mar. April, May .	4	4	24	13	20	8	8	2	17
June, July, Aug. .	3	4	25	20	18	4	3	3	20
Sept. Oct. Nov. .	9	6	23	13	7	3	12	7	20
<i>Mean of Year</i> .	5.5	5	24	15	13	5	8.5	4.5	15.5

TABLE XXI (*continued*)

SEASONAL WINDS AT HOURS OF OBSERVATION. PERCENTAGE OF OBSERVATIONS

(c) RUBJA, BUKOBA

	N.	NE.	E.	SE.	S.	SW.	W.	NW.	C.
7 a.m. :									
Dec. Jan. Feb. .	5	3	15	10.5	15	13.5	8	4.5	25.5
Mar. April, May .	3	7.5	17.5	13	29	12	4.5	4	9.5
June, July, Aug. .	0.5	3.5	17.5	15.5	37	5	4.5	4	12.5
Sept. Oct. Nov. .	4.5	7	22.5	14.5	8	7	9	7	20.5
<i>Mean of Year .</i>	3	5	18	13.5	22	9.5	6.5	5	17.0
2 p.m. :									
Dec. Jan. Feb. .	4	9	38	22	3	6	7	7	4
Mar. April, May .	3	13	43.5	17	9	3	4	4.5	3
June, July, Aug. .	1	11.5	45	33.5	7	0	0	0.5	1.5
Sept. Oct. Nov. .	1	7.5	43.5	22	9	4	4	3.5	5.5
<i>Mean of Year .</i>	2	10	42.5	23.5	7	3	4	4	3.5
9 p.m. :									
Dec. Jan. Feb. .	2	3.5	10.5	4.5	5.5	10	22.5	8	33.5
Mar. April, May .	3	1	8.5	2.5	13	19	16	2	35
June, July, Aug. .	1	2.5	7	9	7	2.5	7	2.5	61.5
Sept. Oct. Nov. .	5	2	7	3	1.5	7	35	8	31.5
<i>Mean of Year .</i>	3	2	8	5	7	9.5	20	5	40.5
Mean of the Day :									
Dec. Jan. Feb. .	4	5.5	21	12.5	8	10	12.5	6.5	20
Mar. April, May .	3	7.5	23	11	17	11	8	3.5	16
June, July, Aug. .	1	6	23	20	17	2.5	4	2	24.5
Sept. Oct. Nov. .	3	6	24.5	13	6	6	16	6	19.5
<i>Mean of Year .</i>	3	6	23	14	12	7.5	10	4.5	20

(d) MUANSA

	N.	NE.	E.	SE.	S.	SW.	W.	NW.	C.
7 a.m. :									
Dec. Jan. Feb. .	2	1	13	19	24	5	3	2	31
Mar. April, May .	1	1	9	27	30	5	2	1	24
June, July, Aug. .	1	1	14	34	19	3	2	1	26
Sept. Oct. Nov. .	3	3	11	23	19	3	1	1	31
<i>Mean of Year</i> .	2	1	12	27	23	4	2	1	28
2 p.m. :									
Dec. Jan. Feb. .	9	5	6	5	12	18	11	22	11
Mar. April, May .	5	3	3	8	9	32	7	23	10
June, July, Aug. .	8	1	4	10	15	22	10	21	9
Sept. Oct. Nov. .	13	5	2	3	6	20	12	28	11
<i>Mean of Year</i> .	9	3.5	4	6.5	10.5	23	10	23.5	10
9 p.m. :									
Dec. Jan. Feb. .	7	3	6	9	10	11	18	10	25
Mar. April, May .	3	4	6	22	9	8	13	12	23
June, July, Aug. .	2	2	4	13	14	9	14	9	33
Sept. Oct. Nov. .	9	5	3	7	9	6	17	17	27
<i>Mean of Year</i> .	5	3.5	5	13	10.5	8.5	15.5	12	27
Mean of the Day :									
Dec. Jan. Feb. .	7	3	8	11	15	11	11	11	23
Mar. April, May .	3	3	6	19	16	15	7	12	19
June, July, Aug. .	4	1	8	20	16	12	9	10	20
Sept. Oct. Nov. .	9	4	6	13	11	10	10	16	21
<i>Mean of Year</i> .	6	3	7	16	14.5	12	9	12	20.5

TABLE XXI (*continued*)SEASONAL WINDS AT HOURS OF OBSERVATION. PERCENTAGE
OF OBSERVATION

(e) MOSHI

* Less than 1 per cent.

	N.	NE.	E.	SE.	S.	SW.	W.	NW.	C.
7 a.m. :									
Dec. Jan. Feb. .	8	7	16	12	11	6	8	7	25
Mar. April, May .	7	8	19	15	12	4	5	4	26
June, July, Aug. .	4	8	14	16	16	6	4	2	30
Sept. Oct. Nov. .	3	8	16	17	17	7	6	3	23
<i>Mean of Year .</i>	5	8	16	15	14	6	6	4	26
2 p.m. :									
Dec. Jan. Feb. .	12	13	15	15	10	9	16	7	3
Mar. April, May .	7	10	18	18	16	10	7	6	8
June, July, Aug. .	4	7	10	15	21	13	6	2	22
Sept. Oct. Nov. .	3	9	27	29	16	5	3	3	5
<i>Mean of Year .</i>	6.5	10	17.5	19	16	9	8	4.5	9.5
9 p.m. :									
Dec. Jan. Feb. .	20	21	16	6	4	3	5	5	20
Mar. April, May .	11	23	32	9	7	3	1	1	13
June, July, Aug. .	3	29	34	10	6	2	2	1	13
Sept. Oct. Nov. .	3	48	35	7	1	*	*	*	5
<i>Mean of Year .</i>	9	30	29	8	4.5	2	2	2	13
Mean of the Day :									
Dec. Jan. Feb. .	14	15	16	9	8	6	9	7	16
Mar. April, May .	8	14	23	14	12	5	5	4	15
June, July, Aug. .	3	15	19	14	15	7	4	1	22
Sept. Oct. Nov. .	3	21	26	18	11	4	3	2	12
<i>Mean of Year .</i>	7	16	21	14	11.5	5.5	5	3.5	16.5

(f) AMANI

	N.	NE.	E.	SE.	S.	SW.	W.	NW.	C.
7 a.m. :									
Dec. Jan. Feb. .	13	18	8	8	6	6	11	17	13
Mar. April, May .	4	6	5	23	18	19	12	9	4
June, July, Aug. .	*	2	2	37	31	15	2	1	10
Sept. Oct. Nov. .	3	5	12	26	17	8	5	4	20
Mean of Year .	5	8	7	23.5	18	12	7.5	8	11
2 p.m. :									
Dec. Jan. Feb. .	5	24	30	25	4	3	3	3	3
Mar. April, May .	*	8	19	43	15	9	2	*	2
June, July, Aug. .	*	2	11	51	21	9	*	0	4
Sept. Oct. Nov. .	1	7	32	41	12	3	1	*	3
Mean of Year .	1.5	10	23	40	13	6	1.5	1	3
9 p.m. :									
Dec. Jan. Feb. .	8	25	18	14	5	5	7	9	9
Mar. April, May .	2	11	9	36	16	10	7	3	6
June, July, Aug. .	*	1	4	45	23	8	3	*	14
Sept. Oct. Nov. .	1	5	14	32	10	9	5	4	20
Mean of Year .	3	10.5	11	32	13.5	8	5.5	4	12.5
Mean of the Day :									
Dec. Jan. Feb. .	9	23	18	15	5	5	7	10	8
Mar. April, May .	2	8	12	34	16	13	7	4	4
June, July, Aug. .	*	1	6	45	25	11	2	*	9
Sept. Oct. Nov. .	2	6	19	33	13	7	4	3	13
Mean of Year .	3	9.5	14	32	15	9	5	4	8.5

TABLE XXII

WINDS OF STRENGTH 4-12, BEAUFORT SCALE, AT ENTebbe

Per 100 Observations at each of the Hours 7, 14, and 21

* 9 p.m. to 7 a.m. 7 a.m. to 2 p.m. 2 p.m. to 9 p.m. Mean.

JANUARY

	No. of winds per 100 observations of strength.			Direction of strong winds.								Average hourly velocity of wind.*
	4-5	6-7	8-12	N.	NE.	E.	SE.	S.	SW.	W.	NW.	
7 hr..	5.0	1.5	0.0	0.5	0.0	0.5	0.0	1.5	0.5	3.5	0.0	2.3
14 hr..	25.0	1.5	0.5	5.0	0.0	3.0	0.0	7.5	6.5	5.0	0.0	2.8
21 hr..	2.0	0.5	0.0	0.5	0.0	0.0	0.0	0.5	0.5	1.0	0.0	2.5
Mean	11.0	1.2	0.2	2.0	0.0	1.2	0.0	3.2	2.5	3.2	0.0	2.5

FEBRUARY

7 hr..	5.0	0.5	0.0		0.5	0.0	2.5	0.0	1.0	0.0	1.5	0.0
14 hr..	13.5	2.5	1.0		2.0	0.0	5.0	0.0	0.0	4.0	5.5	0.5
21 hr..	1.5	0.5	0.0		0.5	0.0	0.0	0.0	0.0	0.5	0.5	0.5
Mean	6.7	1.2	0.3		1.0	0.0	2.5	0.0	0.3	1.5	2.5	0.3

MARCH

7 hr..	8.5	1.5	0.0		1.0	0.0	3.0	0.0	1.0	1.0	3.5	0.5
14 hr..	14.5	10.0	0.5		2.5	0.0	5.5	0.0	3.0	11.0	3.0	0.0
21 hr..	1.5	1.0	0.0		0.5	0.0	0.0	0.0	0.0	0.5	1.5	0.0
Mean	8.2	4.2	0.2		1.3	0.0	2.8	0.0	1.3	4.2	2.7	0.2

APRIL

7 hr..	7.5	2.5	0.0	1.5	0.0	0.5	0.5	1.5	0.0	4.5	1.5	2.3
14 hr..	17.5	3.0	0.5	4.5	0.0	3.5	0.0	4.5	4.5	4.0	0.0	2.7
21 hr..	1.5	1.5	0.0	0.5	0.0	0.0	0.5	1.0	0.5	0.5	0.0	2.3
Mean	8.8	2.3	0.2	2.2	0.0	1.3	0.3	2.3	1.7	3.0	0.3	2.4

MAY

7 hr..	4.5	1.5	0.0	0.0	0.0	1.0	0.0	1.0	1.0	2.0	1.0	2.2
14 hr..	17.5	4.5	1.0	2.0	0.0	1.5	0.5	8.0	5.0	5.0	1.0	2.6
21 hr..	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	2.2
Mean	7.5	2.0	0.3	0.7	0.0	0.8	0.2	3.0	2.0	2.5	0.7	2.3

JUNE

7 hr..	6.0	0.0	0.0	0.0	0.0	1.0	0.5	0.0	1.5	2.5	0.5	2.1
14 hr..	19.5	3.5	0.5	0.5	0.0	2.5	2.0	7.5	5.0	5.5	0.5	2.5
21 hr..	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.5	0.0	2.1
Mean	9.0	1.2	0.2	0.2	0.0	1.2	0.8	2.7	2.3	2.8	0.3	2.2

JULY

7 hr..	6.5	1.0	0.5	0.5	0.0	2.0	0.5	1.0	1.0	1.5	1.5	2.1
14 hr..	19.5	8.5	0.5	0.0	0.0	10.0	1.5	4.0	5.5	7.0	0.5	2.4
21 hr..	2.0	0.5	0.0	0.0	0.0	0.5	0.0	0.0	0.0	2.0	0.0	2.2
Mean	9.3	3.3	0.3	0.2	0.0	4.2	0.7	1.7	2.2	3.5	0.7	2.2

AUGUST

7 hr..	7.5	2.5	0.5	1.0	1.0	2.0	0.5	0.5	2.0	3.5	0.0	2.5
14 hr..	12.0	8.0	0.5	0.5	0.0	1.0	2.0	1.5	7.5	7.5	0.5	2.7
21 hr..	4.5	1.0	0.0	2.5	0.0	1.5	0.0	0.0	0.5	1.0	0.0	2.3
Mean	8.0	3.8	0.3	1.3	0.3	1.5	0.8	0.7	3.3	4.0	0.2	2.5

TABLE XXII (continued)

WINDS OF STRENGTH 4-12, BEAUFORT SCALE, AT ENTEBBE

Per 100 Observations at each of the Hours 7, 14, and 21

* 9 p.m. to 7 a.m. 7 a.m. to 2 p.m. 2 p.m. to 9 p.m. Mean.

SEPTEMBER

	No. of winds per 100 observations of strength.			Direction of strong winds.								Average hourly velocity of wind. *
	4-5	6-7	8-12	N.	NE.	E.	SE.	S.	SW.	W.	NW.	m.p.h.
7 hr..	8.5	3.5	0.5	3.0	0.0	2.5	0.5	2.0	2.5	2.0	0.0	2.6
14 hr..	18.5	6.5	1.0	1.5	0.0	2.0	0.0	7.0	4.0	11.5	0.0	2.9
21 hr..	2.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	2.4
Mean	9.7	3.3	0.5	1.8	0.0	1.5	0.2	3.0	2.5	4.5	0.0	2.6

OCTOBER

7 hr..	7.0	1.5	0.0	1.5	0.0	1.5	0.0	1.5	1.0	3.0	0.0
14 hr..	30.0	9.0	1.0	3.5	0.0	5.0	1.0	7.5	10.0	13.0	0.0
21 hr..	8.5	2.0	0.0	2.0	0.0	0.0	0.0	1.5	3.5	3.5	0.0
Mean	15.2	4.2	0.3	2.3	0.0	2.2	0.3	3.5	4.8	6.5	0.0

NOVEMBER

7 hr..	9.0	0.5	0.0	2.5	0.0	1.5	0.5	0.5	2.0	2.5	0.0
14 hr..	25.5	3.0	0.0	3.5	0.0	1.5	0.5	7.0	9.0	7.0	0.0
21 hr..	2.0	2.0	0.0	1.0	0.0	0.0	0.0	1.0	1.0	1.0	0.0
Mean	12.2	1.8	0.0	2.3	0.0	1.0	0.3	2.8	4.0	3.5	0.0

DECEMBER

7 hr..	8.0	2.5	0.0	3.5	0.5	2.0	0.0	0.0	1.5	3.0	0.0	2.6
14 hr..	21.0	5.0	0.0	4.0	0.0	3.5	0.0	6.0	6.0	6.5	0.0	2.7
21 hr..	4.0	0.5	0.0	0.0	0.0	1.0	0.0	0.0	3.0	0.5	0.0	2.4
Mean .	11.0	2.7	0.0	2.5	0.2	2.2	0.0	2.0	3.5	3.3	0.0	2.6

SEASONAL STRONG WINDS

7 a.m. observations :

Dec.-Feb.	6.0	1.5	0.0	1.5	0.2	1.7	0.0	0.8	0.7	2.7	0.0	
Mar.-May	6.8	1.8	0.0	0.8	0.0	1.5	0.2	1.2	0.7	3.3	1.0	
June-Aug.	6.7	1.2	0.3	0.8	0.3	1.7	0.5	0.5	1.5	2.5	0.6	
Sept.-Nov.	8.2	1.8	0.2	2.3	0.0	1.8	0.3	1.3	1.8	2.5	0.0	
Mean of Year	6.9	1.6	0.1	1.3	0.1	1.7	0.2	0.9	1.2	2.7	0.4	

14 hr. observations :

Dec.-Feb.	19.8	3.0	0.5	3.7	0.0	3.8	0.0	4.5	5.5	5.7	0.2	
Mar.-May	16.5	5.8	0.7	3.0	0.0	3.5	0.2	5.2	6.8	4.0	0.3	
June-Aug.	17.0	6.7	0.5	0.3	0.0	4.5	1.8	4.3	6.0	6.7	0.5	
Sept.-Nov.	24.7	6.2	0.7	2.8	0.0	2.8	0.5	7.2	7.7	10.5	0.0	
Mean of Year	19.5	5.4	0.6	2.4	0.0	3.6	0.6	5.3	6.5	6.7	0.2	

21 hr. observations :

Dec.-Feb.	2.5	0.5	0.0	0.3	0.0	0.3	0.0	0.2	1.3	0.7	0.2	
Mar.-May	1.2	0.8	0.0	0.3	0.0	0.0	0.2	0.3	0.3	0.8	0.0	
June-Aug.	2.7	0.5	0.0	0.8	0.0	0.7	0.0	0.2	0.3	1.2	0.0	
Sept.-Nov.	4.2	1.3	0.0	1.3	0.0	0.0	0.0	0.8	1.8	1.5	0.0	
Mean of Year	2.6	0.8	0.0	0.7	0.0	0.2	0.0	0.4	0.9	1.0	0.0	

TABLE XXIII

LATITUDE, LONGITUDE, AND ALTITUDES OF STATIONS

Rain stations are printed in italics.

	<i>Latitude.</i>	<i>Longitude.</i>	<i>Altitude in feet.</i>	<i>Period.</i>
Lake District. 1° N.-3° S.				
32° E.-35° E.:				
<i>Mumias</i>	0° 20' N.	34° 29' E.	—	Rain: 17 years to 1916.
<i>Mengo</i>	0° 20' N.	32° 34' E.	—	1896-98.
<i>Entebbe</i>	0° 4' N.	32° 28½' E.	3,842	Rain: 18-20 years to 1915.
<i>Kisumu</i>	0° 4' S.	34° 45' E.	3,700	Rain: 14 years to 1916.
<i>Shirati</i>	1° 7' S.	33° 59' E.	3,822	1904-11. Rain: 9 years.
<i>Bukoba</i>	1° 20' S.	31° 51' E.	3,723	Rain: 20 years to 1912.
<i>Rubja</i>	1° 47' S.	31° 37' E.	4,658	1908-12.
<i>Neuwied</i>	2° 0' S.	33° 2' E.	3,956	1904-12.
<i>Muansa</i>	2° 31' S.	32° 54' E.	3,739	1901-11. Rain: 12 years to 1912.
Equatorial Plateau. 1° N.-1½° S.				
35° E.-38° E.:				
<i>Baringo</i>	0° 31' N.	35° 16' E.	6,842	Rain: 9 years to 1914.
<i>Nandi</i>	0° 2' N.	35° 5' E.	6,600	1905-12. Rain: 1905-16.
<i>Eldama Ravine</i>	0° 3' S.	35° 30' E.	7,240	Rain: 11 years to 1913.
<i>Lumbwa</i>	0° 8' S.	35° 32' E.	6,200	Rain: 12 years to 1916.
<i>Muhoroni</i>	0° 10' S.	35° 10' E.	5,560	Rain: 13 years to 1916.
<i>Kericho</i>	0° 23' S.	35° 12' E.	6,600	Rain: 12 years to 1916.
<i>Naivasha</i>	0° 36' S.	36° 28' E.	6,350	1904-8. Rain: 13 years to 1916.
<i>Fort Hall</i>	0° 43' S.	37° 5' E.	4,500	1906-7. 1911-13. Rain: 16 years to 1916.

Sotik, Nyangoris Park . . . 0° 48' S.
 Limoru . . . 1° 9' S.
 Kikuyu . . . 1° 15' S.
 Nairobi . . . 1° 17½' S.
Kitui . . . 1° 22' S.
 Machakos . . . 1° 31' S.

35° 20' E.
 36° 35' E.
 36° 42' E.
 36° 59' E.
 37° 45' E.
 37° 18' E.

6,300
 7,270
 6,700
 5,450
 3,700
 5,650

1911-13. Rain : 7 years to 1916.
 1908. 1911-13. Rain : 10 years to 1916.
 1893-4. 1906-7. Rain : 24 years to 1916.
 1904-16. Rain : 14 years to 1917.
 Rain : 14 years to 1916.
 1901-2. 1904-8. 1911-13. Rain : 18
 years to 1916.

South Frontier. 3° S.-5° S.

36° E.-39° E. :

Moshi . . . 3° 19' S.
 Arusha . . . 3° 22' S.
 Voi . . . 3° 22' S.
Tavela . . . 3° 25' S.
 Mwatate . . . 3° 30' S.
 Amani . . . 5° 6' S.

37° 24' E.
 36° 41' E.
 38° 35' E.
 37° 40' E.
 38° 25' E.
 38° 38' E.

1903-11. Rain : 13 years to 1912.
 1903-11.
 1912-13. Rain : 6 years to 1916.
 Rain : 1907-14.
 1907-8. Rain : 8 years to 1910.
 1901-12.

Coast. 0° S.-6° S.

39° E.-43½° E. :

Kismayu . . . 0° 22' S.
 Lamu . . . 2° 16' S.
 Malindi . . . 3° 13' S.
 Mombasa . . . 4° 10' S.
Shimoni . . . 4° 38' S.
 Tanga . . . 5° 4' S.
 Pemba . . . 5° 15' S.
 Zanzibar . . . 6° 12' S.

43° 33' E.
 40° 54' E.
 40° 7' E.
 39° 40' E.
 39° 21' E.
 39° 7' E.
 39° 43' E.
 39° 19' E.

1896-1900. 18 years to 1913.
 1893. 1911-13. Rain : 9 years to 1916.
 2 years. Rain : 23 years to 1916.
 16 years to 1912. Rain 22 years.
 Rain : 7 years to 1913.
 12 years to 1912. Rain : 18 years to 1912.
 1899-1905. Rain : 14 years to 1916.
 1894-1912.

—
 10
 —
 —
 —
 85
 50
 72

APPENDIX C

MISSIONS IN BRITISH EAST AFRICA

	<i>Denomination.</i>	<i>No. Chapels or Churches in 1914.</i>
Neukirchen Pokomo	Independent	14
Church of Scotland	Church of Scotland	4
Friends Africa Industrial	Friends	3
Africa Inland	Lutheran and	
	Interdenominational	8
Swedish	Lutheran	3
Independent Nilotic	Undenominational	2
Lumbwa Industrial	Non-denominational	2
Seventh Day Adventist	—	2
Italian Roman Catholic	R. C.	12
St. Joseph's (Mill Hill)	R. C.	5
Holy Ghost	R. C.	10
United Methodist Free Church	U. M.	14
South Africa Compound and Interior	Interdenominational	2

INDEX

Figures in heavy type indicate the pages on which the fullest description will be found.

A

- Aard-vark, 209
Aard-wolf, 210
Abakabarasi tribe, 235
Abakisii tribe, 235
Abassi cotton, 408
Abdi Mijid sub-tribe, 254
Abdi Nur (chief), 252
Abdi Salaam (chief), 251
Abdulahi Mahad (chief), 252
Abdullah, Rer, division of the Mohammed Zubeir, 251, 252
Abdurrahman Mursal (chief), 252
Abd Wak sub-tribe, 252
Aberdare Forest, 44, 186, 190, 191, 199, 225, 229
Aberdare Mts., 37, 44, 45, 47, 48, 60, 96, 100, 105, 112, 174, 175, 189, 197-199, 214, 235, 264, 310, 361, 365, 366, 387; fauna, 218-220, 222, 232
Aberdare plain, 184
Aberdeen, Earl of, 484
Aboriginal population, 233
Abukr, Rer, subsection of the Tur Adi, 252
Abuse of Opiates Prevention Ordinance (1913), 325, 327
Abyssinia, 14, 16, 17, 78, 81, 82, 254, 370, 377, 433, 441
communications, 350; frontier, 15, 377, 499
Abyssinian ponies, 440
Acacia, 69, 77, 173, 174, 177, 179-181, 183, 184, 208, 536
Acanthus, 184
Acholi language, 238
Acholi tribe, 236
Adamson (or Kojani) Bay, 537, 543
Aden, 442, 456, 485, 515, 571
Aden Kheir, Rer, subsection of the Rer Mumin Hassan, 252
Aden Shaba (chief), 255
Administrative chiefs, 243-244
Afforestation, 425
Afgab, Rer, subsection of the Rer Mumin Hassan, 252
Afmadu, 296, 297, 375, 376, 391; climate, 131; wells, 78
Afmadu district, 80, 296; native population, 251
Afmadu, Sultan of, 504
Africa Inland Mission, 307, 330, 642
African almond, 548
Afurr, Gara, 14
Afwa, Rer, subdivision of the Rer Abukr, 252
Agricultural experimental stations, 310, 343
implements, importation of, 456
land, 46
machinery, 398
Agriculture, Department of, 399, 418, 421, 434, 438, 471
Ahmed Aden Roble (chief), 250
Ahmed bin Fumo Luti (Simba), 489
Ahmed Gedi, Rer, subsection of the Rer Abukr, 252
Ahmed Nur (chief), 251
Ahmed Weid, Rer, subsection of the Marehan Rer Isaak, 250
Aiendi tribe, 268
Aikipiak, 'L, division of the Masai, 257. *See* Laikipia Masai
Aiser, 'L, clan division of the Masai, 258
Aitayok, 'L: *see* Mengana clan
Ajuuran tribe, 234, 254
Akaba Gulf, 18
Akamba tribe, 37, 38, 40, 235, 236, 240, 242, 243, 247, 249, 263-265, 325, 340, 440, 464, 467, 468, 477, 479
Akikuyu tribe, 235, 236, 240-243, 247, 249, 258, 264, 265, 505. *See* Kikuyu
Akuilo, 77
Albert, L., 350, 462
Albicore: *see* Tuna
Albizia, 184, 187, 188, 191, 197, 200, 426
Alchemilla, 198
Alcoholic drinks, 323; importation of, 454

- Ale, importation of, 455
 Alexandra, 330
 Algan sub-tribe, 253
 Ali, Rer, subdivision of the Rer Abukr, 252
 Ali, Rer, subsection of the Marehan Rer Isaak, 251
 Ali, Seyyid, 574, 578
 Ali Abdi (chief), 255
 Ali Burreh (chief), 251
 Ali Doreh (chief), 251
 Ali Jibril (chief), 251
 Ali Nasr, Rer, subsection of the Rer Abdullah, 252
 Ali Wanag, Rer, subsection of the Rer Abdullah, 252
 Alia Bay, 57, 58
 Alkaline, 113
 Aloes, 179, 181
 Alpine zone : *see* Moorland zone
 Amadin, Rer, subsection of the Rer Abdullah, 251
 Amala R., 66
 Amani, climate, 126, 584-629, 635, 641
 Amara R., 217
 Amaryllis lilies, 548
 Ambach swamps, 336
 Ambergris, 289
 Amboni R., 48
 Amboseli, L., 35
 Amir, Rer, subsection of the Rer Abdullah, 251
 Ana Burru (chief), 253
 Anaemia, 441
 Andesite, 99, 109, 119
 Angata Pus (*or* Blue Plain), 47, 60, 105, 365
 Anglo-German Agreements : (1886) 486-489 ; (1890) 490, 491, 496, 499
 Angora goats, 447
 Animal diseases, 341-345
 parasites, 219, 552
 products, 569
 trypanosomiasis, 216, 217
 Animals and big game, 202-210, 219-232 ; exports, 459
 Ankylostomiasis, 324, 337, 339
 Anole Creek : *see* Arnoleh Creek
 Anophelines, 216
 Ant-bear : *see* Aardvark
 Antelope, 202-205, 209, 439, 549 ; Hunter's, 208, 222 ; pigmy, 225 ; roan, 204, 205, 207, 209, 229 ; sable, 205, 208, 228
 Anthrax, 435
 Ants, 73, 219
 Aoul, 210
 Apes, 208
 Apples, 410
 Apricots, 411
 Arab education, 479
 local authorities, 472
 revolt, 497-498
 rule in East Africa, 482-484
 settlers, 175, 410
 slave trade, 502-503
 stallions, 440, 441
 traders, 484, 485
 Araba, 375
 Arabia, 482-483 ; trade with, 450, 460, 514
 Arabs, 284, 285, 286, 288, 291, 292, 295, 297, 298, 402, 442, 481, 501, 502, 511, 512, 525, 535, 536, 538, 541, 542, 556, 557, 565, 574, 580 ; population statistics, 581
 Arabuko (*or* Sekoki) Forest, 176, 199, 284, 382
 Archaean gneiss, 90, 91, 111
 Archer's Post, 50, 51, 83, 84, 181, 350, 363, 370, 372-374
 Areca palms, 524, 554
 Ariangulu : *see* Wangulu
 Arnole R., 217
 Arnoleh (*or* Anole Creek, *or* Port Tula), 25, 78, 293, 294, 347
 Arodima, 375
 Arras, 379
 Arroga, 390
 Arrowroot, 399, 422, 565
 Arsim R., 84, 102, 373, 374
 Arusha, 359, 360, 364 ; climate, 145-147, 364, 584-605, 608-611, 614-629, 641
 Asego, Mt., 319
 Asembo : *see* Usembo
 Ashakabobo, L., 27, 31
 Asiatics, 309, 310, 312, 313, 453, 467, 476, 515, 516 ; dwellings of, 326, 332 ; education of, 478, 479 ; health conditions for, 324, 326, 330, 332. *See also* Indians
 Atheraka tribe, 235, 244, 264, 265
 Athi plains, 41-44, 97, 98, 110, 114, 117, 173, 184, 257, 339, 359, 384 ; fauna, 202, 203, 207, 209, 211, 219, 220, 223, 226, 227, 229, 231 ; station, 360
 Athi R., 31, 32, 36, 38-40, 43, 45, 93-95, 226, 235, 264, 342, 354, 359, 361, 384, 385
 Attorney General's Department, 471
 Audit Department, 471
 Aulihan sub-tribe, 252, 378
 Aurasuma Habr, sub-tribe, 251
 Austria-Hungary, trade with, 455, 457
 Awach R., 117
 Awa-Isukha tribe, 266

- Awa-Ithakho tribe, 266, 267
 Awakabras (or Kama-lamba) tribe, 266
 Awaketosh (or Masawa) tribe, 266
 Awakirima sub-tribe, 267
 Awakisa tribe, 266
 Awakisii (Kossova) tribe, 267
 Awakisingiri tribe, 266
 Awakisungu sub-tribe, 267
 Awalakoli (or Maragoli) tribe, 267
 Awalewi (or Kikelelwa) tribe, 267
 Awamangali tribe, 267
 Awamarama tribe, 267
 Awamawe sub-tribe, 267
 Awamrashi tribe, 267
 Awamuteti tribe, 267
 Awanyala tribe, 267
 Awanyole tribe, 267
 Awasamia tribe, 267
 Awasheshi tribe, 267
 Awatatsoni tribe, 266
 Awatiriki tribe, 268
 Awatsoso tribe, 268
 Awawanga tribe, 244, 245, 266, 268
 Awaware (or Wachulu) tribe, 266, 268
- B**
- Baboons, 207-209
 Babuba, 514
 Bacon, 445, 453; exports, 459; industry, 309, 445, 465
 Badali people, 275
 Badanna, 377
 Bagalti, 379
 Bagamoyo, 509, 575
 Bagamoyo R. . . see Nyando R.
 Bagasi R., 364
 Baggara, or giant Nile perch, 214
 Bahr el-Jebel, 237
 Bajun (Juba or Dundas) Is., 24, 294, 390
 Bajun people, 240, 292, 295, 390
 Bakeries, 464
 'Bal' fly, 369, 375
 Balarti, 31
 Balessa, 84, 102, 374
 Balessa watercourse, 84
 Bamboo, 174, 189, 190, 192, 195, 196, 198, 426, 429, 537, 548; forests, 198, 208, 365
 Bamboo-beetle, 552
 Bananas, 247, 307, 383, 387, 390, 394, 395, 421, 522, 531, 533, 537, 554, 555, 562; wild, 184, 188
 Banani mission station, 540
 Banani, Ras, 540
 Bandaria Ya Wali, 284
 Banderia Kipeyu: see Port Reitz.
 Banissa, 380
 Bantu language, 239
 Bantu tribes, 233, 235-237, 240, 241, 244, 246, 247, 262, 265-268
 coast tribes, 263
 inland tribes, 264-265
 social organization, 242-244
 Baobab, 173, 177, 181, 274, 430, 533, 534, 547
 Barbel, 214, 448, 551
 Bardera, 81, 378
 Bargash, Seyyid, 485, 486, 488-490, 571, 573, 574, 577
 Bari language, 237, 239
 Bari tribe, 237
 Barietuma, division of Galla tribe, 245
 Baringo, 63, 105, 106, 114, 183, 363, 366, 367, 463; climate, 155-157, 602-605, 640
 Baringo district: fauna, 220, 222, 224, 228-230; population, 238, 248, 581
 Baringo, L., 56, 61, 62, 65, 76, 103, 107, 109, 114, 157, 222, 258, 262, 381
 Bark, 272, 419, 430
 Bark mangrove, 201
 Barley, 401, 422, 439
 Barracuda, or *Tengesi*, 215
 Basalt, 95, 98, 99, 104, 117-119, 121
 Bashir Osman (chief), 251
 Bashora Burrtum(chief), 256
 Bastard cedar, 187, 189, 191, 193, 194, 426
 Bat, 550
 Bathing, 323
Bauhinia reticulata, 177
 Bawe (or Cable) L., 527, 528
 Bawgek, El: see Lago tribe, 261
 Bayardo: see Koli-koli
 Beans, 384, 394, 395, 397, 400, 401, 423, 453, 553; exports, 459
 Beech, Boer, 192, 201, 426
 Bee-eaters, 213
 Beef, 298, 434
 Bee-keepers, 193
 Beer, 453; importation of, 455
 Bees, 443-444; wild, 218
 Beeswax, 307, 448, 569; exports, 459
 Beetles, 216, 404, 405
 Bel el-Ras, ruins of, 528
 Belezoni Canal, 22, 27, 287
 Belfield, Sir H. C., 508, 573
 Belgian Congo: communications with, 350; trade with, 316, 462
 Benadir coast, 501, 515

- Beri-beri, 337
 Berkeley Bay, 13, 71,
 116, 392, 451
 Berlin Act (1885), 493-
 495, 574
 Betel nuts, 410, 560
 Betel pepper, 553
Bhang: see Hemp
 Bilharziasis, 337-339
 Bingi Mts., 69, 119
 Birds, 203, 205, 206,
 210-213, 550; pro-
 tected, 212
 Biotite, 91
 Birikau R., 24, 25, 292.
See Port Durnford
 Birikau (or Burkau) vil-
 lage, 293
 Bishop-birds, 550
 Bismarck, Prince, 486
 Bissel R., 359
 Blackberry bush, 193
 Blackett, Mt., 195
 Black-leg, 435
 Black Mau: *see* Mau
 Narok, 64
 Black R.: *see* Guaso
 Narok R.
 Blackwater fever, 319,
 337
 Black wattle, 397
 Bladder-wort, 177
 Blanket Point, 25, 298
 Blue Plain: *see* Angata
 Pus
 Blue Posts Hotel, 360
 Blood-sucking flies, 215-
 218, 342, 343
 Boats, 448, 449
 Boer settlers, 308
 'Boer' tobacco, 418
 Bohoras, 512
 Boma: *see* Kisii
Bomas, 434
 Bombay, trade with,
 280
 Bongo, 202, 208, 229
 Boni R., 181
 Bonito, 215
 Bon Marehan sub-tribe,
 251
 Boran: *see* Goro escarp-
 ment
 Borana tribes, 15, 82,
 234, 235, 246, 249,
 253, 256, 309, 312,
 372, 430, 433, 438,
 464
 Borities, 200, 291, 426,
 427, 429; exports,
 459, 475
 Bot-flies, 217
 Box, grey, 188, 191-193,
 200
 Brava, 487, 490
 Bread-fruit, 562
 Bream, 214, 448
 Brenner, Richard, 489
 Bridges, 348, 355, 360,
 362, 367, 368, 375
 British courts, 275, 473,
 474
 British East Africa:
 early history, 481-
 483; beginnings of
 English influence,
 483-484; exploration,
 484-485; creation of
 English and German
 spheres of influence,
 485-487; foundation
 of British East Africa
 by a chartered com-
 pany, 487-488; Ger-
 man competition, 488-
 491; the Anglo-Ger-
 man Agreement of
 1890, 491; difficulties
 of the East Africa
 Company, 491-493;
 action of the British
 Government, 493-
 495; withdrawal of
 the Company from
 Uganda and Witu,
 495-496; British East
 Africa as a Protec-
 torate, 496-499; later
 history, 499-508. *See*
also Kenya Colony
and Zanzibar Protec-
 torate
 British East Africa and
 Premier Mills, 424
 British East Africa Cor-
 poration, 408
 British East Africa
 Maizegrowers' Associ-
 ation, 311
 British East African
 Association, 487
 British India Steam
 Navigation Company,
 283, 289, 515, 571, 576
 British possessions,
 trade with, 457, 458
 British Somaliland, 504
 Broad beans, 409
 Brodick Falls, 74
 Broomcorn, 399, 423
 Brussels Act (1890),
 493-495, 577
 Bubonic plague, 335
 Bububu, 528
 Bucks, 204, 208, 210
 Buffalo, 202, 204-210,
 221, 337, 344, 392
 Buffalo grass, 184, 434
 Building material, im-
 portation of, 455
 Bukakata, 318
 Bukedi, 368
 Bukoba, 318, 350; cli-
 mate, 167, 169, 171,
 172, 584-629, 631,
 632, 640
 Bulesa, 374
 Bullock hides, 296, 447
 exports, 459
 transport, 307, 374
 wagons, 347, 359, 360,
 367
 Bullocks, 289, 349, 421,
 422, 433, 435, 444,
 568
 Bumbwini district, 528
 Bun, 297, 464
 Buna, 377
 Bungi, 525
 Bura, 93, 355
 Bura (or Dabida) hills,
 32-34, 93, 354, 355,
 383, 392
 Bura R., 34, 355
 Buret tribe, 260, 262
 Burgal, Ras, 25, 293
 Burgal shoal, 293
 Burkau: *see* Birikau
 Burnet, 422

Burnt Forest inn, 366
 Burrochuma, Gara, 14
 Burton, Richard, 484
 Buru, El: *see* Eburu, Mt.
 Bush, 33-35, 39, 42, 44, 48, 49, 56, 63, 76-78, 80, 90, 170, 173, 174, 178-180, 183, 185, 189, 198, 208, 209, 336, 356, 374, 381, 394, 543, 544
 Bush animals, 208-209
 Bushbuck, 205, 208, 229
 Bushman, 233
 Bush-pigs, 204, 208, 231 439, 549
 Bush-shrike, 550
 Busia, 320, 368
 Busia-Mbale road, 13
 Busigishu sub-tribe, 259
 Busimoro hills, 97
 Busoga railway, 462
 Bustards, 212
 Butiabwa, 350
 Buttalo, 378
 Button quail, 211
 Bwene, Ras, 524, 525
 Bwinzau hill, 36, 37, 40, 93, 361

C

Cabbages, 423
 Cable L., 527, 528
 Cadis, courts of the, 474
 Camel bush, 373, 377 disease, 216, 343, 344, 442 transport, 297, 298
 Camels, 76, 217, 218, 246, 247, 250, 252, 254-257, 344, 348, 349, 369-372, 375-378, 391, 392, 442; export of, 459, 475
 Camphor bush, 185, 188
 Camphor trees, 174, 188, 190, 193, 194, 199, 201, 423, 425, 426
 Campi ya Nyama Yanga, 207
 Camps, 218, 339, 351

Canary grass, 422
 Canning, Lord, 484
 Canoes, fishing and navigation, 286, 448, 449
 Caravan routes and traffic, 78, 83, 297, 338, 353, 354, 361, 364, 366, 500, 501, 505
 Carissa bush, 185
 Carp, 214
 Carpenter bees, 218
 Carrier corps, 468
 Cashew, 177, 410, 562
 Cassava, 421, 554, 555, 560
 Cassia *didimobotrya*, 184
 Castor-oil plant, 554, 564
 Casuarina trees, 541
 Cataracts, 30
 Cat-fish, 214, 448, 551
 Cattle, 46, 54, 76, 216, 217, 246, 252-255, 259, 292, 307, 309, 311, 342-345, 384, 388, 389, 391, 392, 422, 431, 432, 434-436, 444, 463, 464, 566 disease, 218, 219, 324, 341, 343, 435, 505 exports, 459 trade, 246, 297
 Cattle-fly, 217, 341, 343, 435
 Cauliflowers, 423
 Caves, 19, 38, 75, 86, 112, 123, 372, 526
 Ceara rubber, 566
 Cedars, 54, 73, 174, 181, 184, 189, 190, 192, 194, 196-200, 423-426; cedar forests, 189, 192, 348, 388
 Central Highland plateau: physical features, 42-51
 Central I. (or Choro), 58
 Cereals, 394, 395, 398, 522, 533, 539, 561
 Cerebro-spinal meningitis, 334

Chaka, 362
 Chake Chake, 535-536, 539; wireless station, 536
 Chake Chake Bay, 534, 537-540
 Chala hill, 357
 Chala, L., 12, 35, 356
 Chalcedony, 113, 114, 120
 Chale I., 19, 273
 Chale Point, 19, 273
 Chambui, 357
 Chameleon, 550
 Chandegi R., 537
 Changa: *see* Changuu
 Changamwe, 87, 279
 Chango: *see* Changuu
 Changu, 449
 Changuu I. (Changa, Chango, Prison I.), 528
 Chania Bridge, 41, 348, 360, 402
 Chania Falls, 98
 Chania R., 45, 98, 314, 360
 Chanler's Falls, 50, 101, 391
 Chapwani (Grave I.), 527
 Charra, 22, 287
 Cha Shimba (or Pemba) R., 28, 283
 Cheb-Karat, 367
 Chebukuto (chief), 261
 Cheese, 453
 Cheetah, 204, 210, 232
 Chemorongi: *see* Lange-teilo Range
 Chepalungu Forest, 65, 66, 388
 Cherangani Mts.: *see* Chibcheranan Mts
 Cherawe, 531
 Cherries, 410
 Chestnut, Cape, 189, 200, 426
 Chibcheranan (or Cherangani) Mts.: 73-75
 Chiggers: *see* Jiggers
 Chillako, 14

- Chillies, 399, 404, 422, 523, 553, 561; exports, 459, 475
 China manufacture, 289
 Chiombe: *see* Mgombe
 Chiremo Ali (chief), 254
 Chiumbo: *see* Mgombe
 Chokani, 518
 Chokocho, 538
 Cholera, 338
 Chombe I., 526
 Chonyi, Mt., 29
 Chonyi tribe, 263
 Chooko, 564
 Chore: *see* Jereh district
 Choro: *see* Central I.
 Chuaka: *see* Chwaka Head
 Chuka, 305
 Chuka (or Shuka) tribe, 244, 265
 Chukwani, 510; palace, 526
 Church Missionary Society, 313, 338, 352, 501; hospital, 330; schools, 301, 303
 Church of Scotland Mission, 306, 330, 642; school, 312
 Churre Moyale, 14, 82, 296
 Chwaka, 519, 520, 531
 Chwaka Bay, 531, 545, 563
 Chwaka (Mapopwe or Jangwani) depression, 522-524, 531, 563
 Chwaka (Chuaka) Head, 531
 Chweni, 559; palace, 528
 Chyulu hills, 357
 Cinnamon, 564
 Citrate of lime, 401
 Citric acid, 401
 Citrus fruit, 382, 384, 388, 397-399, 400-402, 562
 industry, 38, 401-402
 land, 401
 trees, 177, 297
 Citrus-moth, 219
 Civet-cat, 209, 549
 Civil Procedure, 473
 Clan divisions, 244-245, 258
 Clan-Ellerman-Harrison Line, 283, 515
 Clay, 112-115, 119, 196, 393, 451
 Claystone, 98
 Cloth, 464, 465
 Cloud, 129, 135, 141, 150, 151, 154, 159, 166, 170, 610-611
 Clover, 184
 Cloves and clove plantations, 184, 519, 521, 522, 524, 534-537, 539, 540, 542, 553-556, 558, 564
 Clutterbuck's Mill, 424
 Coal, 393
 Coastal region:
 agriculture, 381-383, 395-397, 403, 410, 411, 413, 415, 418, 421, 422
 climate, 26, 124-125, 130-144, 382, 584-629, 641
 Coast plain, 25-30, 178
 communications, 350-353
 forests, 27; forest products, 425, 430
 geology, 85-90, 393
 health conditions, 332-334, 336, 339, 343
 hills, 27-30
 islands, population, 240
 physical geography, 18-30
 ports and towns, 270-299
 tembo industry, 403
 vegetation, 175-177
 Cob, Uganda, 226
 Cobras, 213, 550
 Cocoa, 422
 Coco-butter, 403
 Coconut beetle, 219, 399, 550
 Coconut oil, 402, 403, 559, 563
 Coconut palms and coconuts, 173, 175, 177, 271, 288, 290, 313, 314, 382, 394, 397, 399, 402-405, 414, 524-526, 529-533, 537, 539, 553-555, 559; coconut exports, 459, 460; plantations, 284, 291, 396, 404, 408, 540, 541, 552, 554
 Coconut Preservation Ordinance (1915), 404
Coffea arabica, 405
 Coffee, 219, 308, 315, 381, 385, 386, 388, 395, 396, 398, 399, 401, 405-407, 409, 421, 453, 464; exports, 459, 460; plantations, 306, 386, 405, 406; wild coffee, 196, 407
 Coffee-berry, 464
 Coffee-bug, 219
 Coffee-leaf disease, 407
 Coir-rope, 402, 559, 560
 Colies, 213
 Colon bacillus, 435
 Colonists' Association, 507
Combretum, 185
Commiphora bushes, 179
 Comoro Is., 512
 Compagnie des Messageries Maritimes, 515
 Congo Equatorial forest, 186
 Congo pea, or pigeon pea, 553, 554, 564
 Convict settlement, 296
 Co-operative creamery, 445
 Coats, 212
 Copal, 176, 200, 201, 429
 Copra, 219, 395, 402-405, 464, 559, 560, 563; exports, 405, 457, 459, 460

- Coral, 86, 87, 89, 278, 285, 290, 292, 293, 393, 518-520, 523, 531, 538, 547, 583
 islands, 19, 22-24, 274, 518, 525, 534
 limestone, 90, 177, 559
 plain, 175, 176
 reefs, 24, 86, 87, 298, 530, 543
 rock, 90; coral-rock roads, 296
 Coralline islands, 527
 Coreopsis, 184
 Cork, 192
 Cormorant, 212
 Corn, 297
 Cotton, 296, 297, 315, 382, 383, 390, 391, 395, 397, 399, 407-408; exports, 459
 Cotton ginning, 316, 408, 464
 Cotton planting, 285
 Cotton-seed, 335
 Cotton soil, 90, 92, 101, 112-114, 119, 178, 181, 184, 375, 376, 384, 387, 389, 415, 442
 Cotton textiles, importation of, 454
 Couch-grass, 184, 422, 434
 Cow-herons, 213
 Cowries, 292, 570; exports, 459, 475
 Cows, 329, 433-435, 444, 445, 568
 Crabs, 215, 449, 569
 Cranes, 212
 Crater Camp, 357
 Crater lakes, 35, 49, 68, 83, 99, 101, 181, 371, 392
 Craters, 50, 53-56, 75, 83, 96, 99-101, 103, 107, 109, 111, 117
 Crayfish, 569
 Crickets, 216
 Criminal procedure, 473
 Crocodiles, 35, 213, 247, 358, 375
 Croton, 183, 184, 187, 427
 Crow, white-backed, 550
 Crown lands, 174, 199, 200, 470, 477, 506, 508; sale and lease of, 474
 Crown Lands Ordinance (1902), 506
 Curlew, 212
Cussonia spicata, 188
 Custard apple, 177, 410, 562
 Customs Department, 471
 Customs duties, 475, 493-496
 Cut-worms, 219, 407, 412
 Cypressess, 425
 Cyprinoid, 214
- D
- Dabida hills: *see* Bura hills
 Dabli, 379
 Dadu Korecha (chief), 254
 Dagodia, *or* Dagodia Fai: *see* Yaben
 Dagoreti, 303, 335, 361, 364, 425, 496
 Dai (= swamp), 378
 Daiga, El, 49
 Daigan, 180
 Dairy farming, 309, 342, 388, 566; produce, 445-446, 464; stock, 422
 'Dais', 378
 Dai Salole, 378
 Dakach, 217, 378
 Dandru, 378
 Dar, 379
 Dar es-Salaam, 509, 514, 569, 575
 Dar-es-Salaam-Tanganyika Railway, 462
 Darter, 212
 Date palms, 57, 184, 521; wild, 546, 548
 Dava R., 14, 15, 78, 80, 255, 257
 Debel, 376, 377, 378
 Deforestation, 386, 390
 Dege, Ras, 509
 Delamere, Lord, 420, 421, 507
 Delamere's Pool, 83
 Deleb palm, 549
 Delgado, Cape, 486
 Dengue fever, 338
 Denhardt, Clemens, 489
 Denli, 379
 Deria Chakool, 250
 Derkali, 255
 Desert zone: *see* Nyika zone
 Deshek Arras, 379
 Deshek Wama, 80, 251, 253
 Deutsche Ostafrika Line, 575, 576
 Dhows, 19, 20, 25, 176, 280, 286, 290-293, 353, 427, 514, 527, 542, 543, 558, 560; dhow-building, 289
 Dicks Head (*or* Ras Kiamboni), 24, 291
 Dido Gulullo, 83, 372
 Dieff, 376
 Digestive troubles, 338
 Digil: *see* Rahanwein
 Digo tribe, 263
 Dik-diks, 205, 208-210, 225
 Dimtu, Gara, 14
 Dinka language, 238
 Disbahai sub-tribe, 255
 Diseases, 332-341; of animals, 341-345
 Diseases of Animals Ordinances (1906, 1915, and 1917), 327, 341
 Dispensaries, list of, 330
 District Commissioners, 471, 473-475, 503
 Dodori Creek, 30
 Dodori R., 30, 176
 Dogs, 206, 209, 343
 Doiju, El (*or* Doigio), sub-tribe, 259

- Dolbahanta, division of the Herti tribe, 253
 Dolerite, 120, 121
 Dolo, 15, 80, 217, 250, 257, 347, 377, 379, 391
 Dolphin, 215, 449
 Dom palm (ivory-nut tree), 51, 84, 177, 179-181
 Dominuki's village, 49, 363, 387
 Domoni, North Ras (Ras Kionwa), 539
 Domoni, South Ras, 538
 Donge hills, 529
 Dongo Kundu, 22, 287, 540
 Donkeys, 76, 246, 259, 349, 357, 367, 369, 372, 440, 441, 568; expert of, 475
 Donyo Sabuk: *see* Ol Donyo Sabuk
 Dormice, 208
 Dotterel, 212
 Doves, 211
 Dracaenas, 188
 Driftwood, 351
 Drink traffic, 325, 488
 Drinking-water, 322, 323, 336, 338
 Duck, 212
 Duiker clan, 245
 Duikers, 208, 223, 224
 Dumbi Moyale, 82
 Dundas Is.: *see* Bajun Is., 294
 Dunga ridge, 521, 522
 Dungu, 521
 Darian, 562
 Durnford Point, 179, 181
 Durnford (or Birikau) R., 24, 176: *see* Port Durnford
 Durriah, El, sub-tribe, 255
 Duruma sandstone, 85-88
 Duruma tribe, 256, 263
 Dutch language, 478
 Dye-wood, 427
 Dysentery, 324, 336
 Dzihana (Jibana) tribe, 263
 E
 Eagle-owl, 212
 Eagles, 211
 Earthquakes, 103
 East African police, 300, 310
 East Coast fever, 342, 387, 431, 433, 435, 566, 567
 East India Company, 483
 Eastern Highlands: geology, 90-95
 physical features, 37-42
 Eastern Telegraph Company, 274
 Ebony, 177, 180, 181, 199, 200, 382, 423, 425, 427; exports, 475
 Eburu (El Buru), Mt., 55, 103, 107
 Economic Commission (1917), 458
 Education Department, 471
 Egg-fruit, 562
 Eggs, 453
 Egrets, 204
 Egypt, trade with, 455, 456, 458
 Eil Bode, 377, 380
 Eil Dima hills, 14
 Eil Las, 377
 Eil Mole, 14
 Eil Tuli, 90, 376
 Eil Wak, 78, 90, 179, 255, 297, 377-380, 442
 Eili Dera, Rer, sub-section of the Mareham Rer Isaak, 251
 El: *see* under specific name
 Eland, 202-209, 229
 Elburgon, 64, 303
 Eldalat, 424
 Eldalat, Mt., 73
 Eldama Ravine, 64, 65, 72, 73, 110, 303-304, 308, 331, 366, 389
 climate, 125, 128, 129, 155-160, 584-629, 640
 communications, 303
 forest, 196
 population, 304, 581
 Eldama R., 72
 Eldere R., 304
 Eldoret, 74, 304, 308, 330, 366, 388, 389, 478
 communications, 304, 367
 population, 304
 rainfall statistics, 158
 Elephant, 203, 205, 207, 208, 210, 219, 354, 392, 447
 Elephant grass, 26, 56, 179, 181, 183, 351, 549
 Elephantiasis, 338, 339
 Elges desert, 84
 Elgeyo district: population, 581
 Elgeyo escarpment, 62-64, 67, 73, 74, 76, 103, 106, 111, 185, 195, 196, 389
 Elgeyo Forest, 73, 195, 196
 Elgeyo tribe, 260.
 Elgin, Lord, 506
 Elgon Forest, 186, 197
 Elgon, Mt., 13, 17, 37, 71-75, 96, 111, 112, 122, 123, 127, 174, 175, 182, 198, 199, 341, 368
 caves, 112, 123
 fauna, 211, 219, 220, 222-224, 226, 229, 230.
 native population, 233, 234, 236, 260, 261, 265, 266
 Elgon plain, 75
 Elgonyi tribe, 237

- Elgumi : *see* Wamia
 Eliot, Sir Charles, 506
 Elmenteita, 103, 115,
 388, 393, 436 ; rail-
 way station, 55, 365
 Elmenteita, L., 52, 55,
 56, 60, 109, 231, 365
 Elumino ridge, 310
 Embarta steppes, 51
 Embere hills, 40
 Embu, 40, 46, 153, 154,
 304-305, 361-363, 387
 Embu district, 40, 46,
 191, 224, 475 ; popu-
 lation, 581
 Embu tribe, 244, 264,
 265, 467, 505
 Emin Pasha, 491
 Emin Pasha Gulf, 170
 Emperor Navigation
 Company, 297
 Emwele hill, 176
 En Aiposha, division of
 the Masai, 257
 Endabibi plain, 55, 365
 Enderit R., 55
 Enderois, section of
 Kamasia tribe, 261
 Endima Mau, 64
 Endo tribe, 245, 248,
 260, 262
 Endwoinet, 197
 Engare Dabash, 66
 Engeramai, L., 53, 61,
 104, 107, 108
 English Point, 273, 274
 Enjororowa valley, 54,
 103, 107, 109
 Entebbe, 318, 350 ; cli-
 mate, 169, 172, 584-
 611, 614-630, 636
 Enteric, 338
 Epidemics, 335
 Equator Peak, 55, 107
 Equator Saw-mills Ltd.,
 424
 Equatorial Plateau :
 climate, 129, 148-163,
 584-629, 640
 Erimba : *see* Marti pla-
 teau
 Erok highland forest,
 186
 Erok, Mt. (*or* Ol Donyo
 Erok), 12, 35, 42, 197,
 350, 359, 360
 Erri Mts., 56, 57, 107,
 109
 Escarpment, 305, 445
 Esie hill, 51
 Ethnology, 233-240
 Etossio : *see* Wamia
 Eucalyptus, 425
 Euphorbia, 173, 179,
 181, 183, 184, 546,
 547, 554
 Eurasians, 478
 European colonists :
 civil and criminal
 courts, 473
 clothing, 323
 colonists and the Gov-
 ernment, 505-508
 death-rate, 322
 dwellings, 322-323
 education of children,
 478-479
 health conditions, 321-
 324, 330, 332, 335,
 337
 land tenure, 506
 population statistics,
 581, 582
 relations with natives,
 506-507
 settlements, 270, 273-
 276, 285, 297, 301,
 306-309, 313-316
 vegetable supplies,
 423
 Executive Council, 470
 Expeditionary Force,
 444, 453, 454, 455,
 458
 Experimental farms,
 399
 Eye troubles, 338
- F
- Fai sub-tribe, 257
 Farah Got (chief), 250
 Farah Ugas, Rer, sub-
 section of the Mare-
 han Rer Isaac, 250
 Fawatu I., 298
 Fawn Pass, 298
 Faza (*or* Paza), 24, 291,
 292
 Fazi I., 24
 Felspar, 89, 91, 92, 98,
 114, 115, 117
 Ferns, 547, 548
 Ferrandi, 132
 Fever, 371
 Fibres, 402, 404, 408,
 430 ; exports, 458-
 460
 Figs, 183, 411, 553
 Filariasis, 216, 334, 338,
 339
 Fire-tree, 177
 Firewood, 198-200, 401,
 425, 429
 Fischer, Dr. G. A., 485
 Fish, 203, 214-215, 289,
 298, 318, 551, 568
 Protection Ordinance
 of 1908, 448
 Fish-eagles, 204
 Fishing, 206, 215, 216,
 247, 314, 318, 465, 533,
 568 ; licences, 214
 Fiwe bean, 564
 Flageolets, 400
 Flamingoes, 212
 Flax, 309, 388, 389, 394,
 396, 398, 400, 401,
 408-410 ; exports, 459,
 461
 Fleas, 336, 552
 Flies, 170, 215, 216, 218,
 341, 343, 351, 353, 360,
 384, 391 ; fly-belts,
 217, 343, 344, 356, 378.
 See Tsetse-fly
 Flora Point : *see* Kigan-
 gone, Ras
 Flour, 453 ; mills, 308,
 464
 Flowers, 184
 Fodder, 184, 422, 424
 Fogs, 148, 151
 Food in relation to
 health, 323
 Foot-rot, 438
 Forage grasses, 422
 Foreign Jurisdiction Act
 (1890), 470

- Forest animals, 207-208
 licences, 199
 nurseries, 303, 308, 312, 425
 reserves, 199, 381, 478
 royalties, 199, 200
 Forest-hog, 202, 208, 231
 Forestry Department, 425, 471
 Forests, 27, 29, 30, 33, 34, 44, 46, 47, 61, 62, 64-66, 72, 73, 75, 77, 81, 112, 113, 170, 174-176, 179-197, 199, 200, 356, 386, 388, 389, 394, 423, 443
 Forests Ordinance (1911), 174, 185, 187; synopsis of rules, 199-200
 Forest squirrels, 208
 Formosa Bay, 18, 22, 126
 Fort Hall, 39, 40, 44, 45, 94, 98, 207, 304, 305, 312, 314, 330, 331, 463
 climate, 125, 129, 130, 152-155, 584-611, 614-629, 640
 communications, 305, 359-362
 Fort Hall district :
 agriculture, 182, 387, 396
 fauna, 224, 231
 health conditions, 324, 330, 331
 population, 581
 taxes, 475
 Fort Hannington : *see* Moyale post
 Fort Smith, 127, 608, 618
 Fort Ternan, 67, 72, 110, 111
 Fowl, 343
 Fowl-cholera, 443
 Framboesia : *see* Yaws
 France and the Zanzibar Protectorate, 486, 572
 trade with, 455, 458, 460
 Francolins, 203, 210, 211
 French mission schools, 478
 Freretown, 28, 88, 273, 274
 Fruit, 289, 309, 313, 391, 401, 403, 410, 453, 522, 562
 Fruit-growing, 384, 388
 Fruit-pigeon, 550
 Fuel, 184, 304, 424, 425; fuel areas, 174. *See* Firewood
 Fufuni (*or* Kangani), 537, 538
 Fuladoyo (*or* Vitengeni) R., 32
 Fuller's earth, 115, 393, 451
 Fulusi : *see* Dolphin
 Fumba, Ras, 525, 526
 Fundu Gap, 541
 Fundu L., 541, 542
 Fungal, 78, 80
 Fungoid disease, 402
 Fungu Kizimkazi : *see* Latham L.
 Funzi Bay, 19
 Funzi L., 19, 26, 272, 540
 Funzi village, 19, 272
 Furroli, Gara, 14, 82

 G
 Gababa (chief), 255
 Gabawein tribe, 257, 391
 Gabbra tribe, 253
 Gaddaduma, 15, 81, 82, 377, 380
 Gadeir, 380
 Gadeir, Gara, 380
 Gadflies, 217, 218, 341, 442, 551
 Gahad Fillul, 250
 Galanaba L., (*or* Oda Boru Ruva), 31, 383
 Galawa, *or* dug-out, 569
 Galdelan sub-tribe, 255
 Galla tribes, 233-236, 241, 245, 246, 248, 253-254, 256, 258, 263, 288, 314, 504
 Gallarassa (chief), 254
 Gamado clan, 256
 Gama Gar swamp, 79
 Game, big, 202-210, 217, 219
 hunting, 202, 203, 205, 206, 207, 208, 213
 licences, 205, 207, 219-232
 list of animals, 219-232
 preservation, 204-207, 229, 231, 232
 reserves, 202, 206, 207, 220, 227, 228, 230
 Game-birds, 203, 205, 209-211, 550
 Game Department, 471
 Game-meat, 203
 Game Ordinances, 204, 442, 447
 Ganale Gof, 50, 375
 Ganale R., 15, 80
 Gandad, Gara, 81
 Gara : *see under specific name*
 Garar wells, 15
 Garen sub-tribe, 254
 Garfish, 215, 449
 Garganey, 212
 Garnet, 89, 92, 111
 Garra sub-tribe, 253
 Garrba Tula, 50, 363, 375
 Garre Baharre, 379
 Garreb tribe, 255
 Gashi sub-tribe, 254
 Gastero-enteritis, 342
 Gazelles, 202, 205, 209, 210, 227, 228
 Gazi, 18, 26, 273, 498; communications, 273, 350, 351
 Gazi Bay, 19, 273
 Gelbereis sub-tribe, 254
 Gelebleh sub-tribe, 254
 Gelei, Mt., 364
 Gelli, 378, 379
 Gemi (*or* Kami) tribe, 268, 269

- General Mathew's range: *see* Mathew range
 Genet, 210
 Gerard, Rer, subsection of the Marehan Rer Isaac, 251
 Gerbils, 209
 Gere Ali Gabawein, (chief), 250
 Gerenuk, 205, 208, 210
 German East Africa, 165; railways, 461; trade with, 316, 450, 458, 461, 462. *See* Tanganyika Territory
 German East Africa Company, 488, 492, 501
 German Ford, 357
 'German road', 485, 575, 576
 Germany and the Zanzibar Protectorate, 486, 491, 572, 574-576
 trade with, 455-457, 460
 Gesellschaft für deutsche Kolonisation, 486
 Geydu, son of Afulata (chief), 253
 Ghalinti Ali (chief), 252
 Ghee, 432, 446; exports, 459
 Giant Nile perch: *see* *Baggara*
 Giant reed, 548
 Gichugu tribe, 264
 Gilgil, 55, 60, 103, 105, 311, 363, 365, 388
 Gilgil R., 55, 60
 Giraffes, 204-206, 208-210, 221
 Giriama country, 29, 352
 Giriama hills, 27, 29, 32, 88
 Giriama tribe, 263, 325, 467, 498, 505. *See* Wa-Giriama
 Girouard, Sir P., 505
 Gumbo, 350, 378
 Glaciers, 46, 99, 100, 199
Glossina: *see* Tsetse-fly
 Gneiss area, 90-95, 116
 Goanese, 274, 330, 463, 468, 478, 512; population statistics, 581; trade, 275
 Goats, 76, 209, 254, 259, 292, 309, 312, 431, 438-439, 444, 567, 568; disease, 342; exports, 459
 Goat-skins, 447, 463, 464
 Gobwen, 78, 295, 298, 299, 350, 378 *See* Gabawein tribe and Gubawen country
 Godana (chief), 256
 Gogo Falls, 70
 Golbo plain, 81
 Golbo sub-tribe, 253
 Golja, 376, 380
 Gonja, 26
 Gonorrhoea, 340
 Gonya Gap, 358
 Goose, spur-winged, 212
 'Gora', 369
 Gorna sub-tribe, 253
 Goro (or Boran) escarpment, 14, 15, 81, 82, 372, 377
 Gosha district, 391; population, 581
 Goya, Gara, 14
 Grain, 26, 65, 76, 284, 286, 307, 315, 316, 335, 348, 389, 390; exports, 457, 459; imports, 455
 Grand Falls, 42, 94
 Granite, 85, 94, 111, 115, 116, 119
 Grant, J. A., 485
 Granville, Earl, 489
 Grapes, 411
 Graphite, 89, 451
 Grass, 182-184, 190, 192, 195, 196, 203, 431, 488, 548, 549
 Grass fires, 183, 190, 191, 197
 Grass huts, 325
 Grazing, 77, 79, 80, 82, 173, 179, 389, 392, 422, 434, 439
 Great Britain: *see* United Kingdom
 Great Rift Valley, 485
 Grebes, 212
 Green bush monkey, 549
 Green Islet, 298
 Greenheart, 188, 189, 191, 192, 194, 196, 201, 327, 425
Grewia populifolia, 179
 Griffon, 211
 Grogan-leased forest, 185
 Ground-nuts, 404, 421, 563, 564
 Ground orchids, 548
 Guaso Boli R.: *see* Ol Arabel R.
 Guaso Narok (or Black) R., 47-49, 105, 362
 Guaso Nyiro R., 39, 40, 45, 49-51, 64, 65, 79, 83, 84, 91, 94-96, 100, 101, 108, 178, 220, 221, 231, 253, 254, 256, 259, 350, 363, 364, 370, 374, 375, 381, 391, 464
 Northern, 181, 202, 207, 214, 217, 223, 225, 227, 229-231, 362
 Southern, 206, 227
 Western, 52, 66
 Guava, 410, 562
 Gubawen country, 391
 Guinea-fowl, 203, 210, 211, 550
 Gulola swamp, 79, 390
 Gulu clan, 256
 Gum copal, 200, 429, 475; exports, 459
 Gungodi (or Kiguguli), 529
 Guranlegga (or Lak Guran) R., 79, 390
 Gurekeri Bay, 69
 Gurgumwa, 374
 Gurre, R., 15
 Gurre tribe, 234
 Guru R., 214

Gusr Gudr tribe, 257
Gwasi, Mt., 69, 70, 118
Gypsum, 90, 118

H

Habr Auarasama, sub-tribe, 251
Habr Suliman sub-tribe, 251
Habr Yacob sub-tribe, 251
Hagenia anthelmintica, 189
Hailstorms, 129, 159, 612
Haji Farah (chief), 252
Haji Mohammed (chief), 252
Haldaiyan, 82
Ham, 445; exports, 459
Hameye, 31, 42, 94, 347
Hamid, Seyyid (Hamid bin Thuain), 574
Hamite tribes, 233, 234, 236, 240, 241, 250-257
Hamitic-Negroid tribes, 236-239, 241, 249, 257-263
Hamoud, Seyyid (Hamid bin Hamoud), 574, 579
Hamster rat, 550
Hannington (or Losuguta), L., 55, 56, 61, 62, 103, 106, 107, 109
Haramu Passage, 541
Harbours, 20, 270-299
Hardinge, Sir A., 503, 579
Hardwood, 174, 188, 191, 192, 196
Harlequin quail, 211
Hartebeest, 203-205, 209, 221, 222
Hassan Rer, sub-tribe of the Marehan, 250
Hassan Daba (chief), 251
Hassan Weji (chief), 252
Hatajwa hill, 518, 521, 526, 529

Hatajwa: *see* Kombeni peninsula
Hawash, Rer, sub-section of the Tur Adi, 252
Heaths, 198
Hebadu hill, 288
Hedgehog, 209
Helwalud, 391
Hemp (*bhang*) smoking, 325
Hen harrier, 211
Herons, Goliath, 212
Hersi, Rer, sub-section of the Rer Abdullah, 251
Herti Somalis, 295-297
Herti tribes, 253, 504
Hibiscus, 549
Hides, 289, 296, 432, 447, 569; exports, 457, 458, 475
Higgis, Rer, sub-section of the Rer Abdullah, 252
Highland Region: agriculture, 396-398, 400, 406-408, 410-413, 418, 420-423, 457
climate, 125, 385
communications, 359-369
economic conditions, 381, 384-387
forest zone, 175; area, 174, 185-187; vegetation, 185-197
forests, 424-426, 428, 430
geology, 95-115
health conditions, 321, 323, 324, 345
live stock, 431-433, 439, 440, 446
Hill tribes, 236, 237, 247, 248
Hindus, 512
Hippopotamus, 204, 205, 231, 549; teeth exports, 475
Hoggasu well, 378
Höhnel, von 485

Holali, 15, 372
Holland, trade with, 454, 457
Homa Bay, 68, 117, 318
Homa Bay trading station, 165, 318-319; communications, 307, 318, 368, 369
Homa, Mt., 68, 117, 118, 319, 393
Homa Point, 68
Honey, 444
Honey-guide, 213
Hornbills, 212, 550
Hornblende, 91, 119
Horodera, 372
Horr R. and valley, 373, 374
Horse-chestnut, 200
Horses, 217, 247, 250, 388, 421, 440-441, 568; exports, 475
Horse-sickness, 341, 343, 344, 440, 441
Hospitals, 275, 301, 307, 329; list of, 330
Hot springs, 53, 77, 89, 103, 108
Humbali, 379
Humidity, 128, 134, 135, 141, 143, 147, 171, 612-613
Hunting dogs, 206, 209
Huri hills, 51, 82, 84, 101, 102
Huts, 248, 273, 284, 325; hut-tax, 474, 503
Hyaena, spotted, 210
Hydro-electric station, 313

I

Ibean ash, 193
Ibis, 212
Ibrahim, Sheikh, 251
Ibrahim Burreh, 251
Ibrahim Shubo (chief), 252
Idau, 291
Ido Roble (chief), 254
Iganga, 316
Ihangiro, 166, 170

- Ikoka* : *see* Couch-grass
 Ilaot, 373, 374
 Ildalat, 115
 Illani clan, 256
 Ilook-grass, 548, 555
 Impalla, 205, 208, 209, 226
 Imperial British East Africa Company, 487-488, 490-496, 500-502
 Indanai hills, 65
 India : penal codes of, 473 ; trade with, 280, 296, 440, 445, 454, 455, 456, 458, 514, 558, 566, 575
 Indian bazaars, 302, 305, 309, 310, 312, 315, 326, 335, 536
 Indian buffaloes, 568
 Indian corn, 382
 Indian labour, 465, 507
 Indian mulberry, 563
 Indian Ocean, 274, 278, 281, 510, 522
 Indian traders and settlers, 271, 274, 284, 288, 295, 300, 304-307, 314, 315, 318, 319, 326, 335, 402, 423, 424, 432, 453, 462-465, 468, 479, 484, 512, 514, 541, 556, 557, 566 ; population statistics, 581
 Indian troops, 496, 498
 Industrial alcohol, 412
 Infectious Diseases Ordinances (1903 and 1917), 326
 Insect pests, 215, 219, 338, 339, 402, 407, 550, 551
 Intestinal worm, 438
 Intoxicating drink, 395, 403
 Inyamindi R., 41, 362
 Irída, division of Galla tribe, 245
 Irerr, 373
 Irerr R., 373
 Iris, 184
 Ironbarks, 425
 Iron ochre, 121
 Iron ore, 113, 392, 451
 Ironstone, 87, 118
 Ironwood, 194, 423, 424, 425, 427 ; black, 188, 189, 190, 192, 194, 196, 201 ; white, 188, 189, 201, 429
 Irrigation, 248, 395, 397
 Isaak, Rer, division of the Mohammed Zubeir, 251
 Isaak, Rer, sub-tribe of the Marehan, 250
 Isiola R., 49
 Islam, 240, 275, 498, 516
 Isukha country, 266
 Isukha R., 268
 Isuria escarpment, 13, 66
 Italian East African line, 282, 299
 Italian Somaliland, 15, 18, 297, 378, 379, 490, 499, 504, 572 ; trade with, 442, 460-462
 Italy, trade with, 454, 458, 460
 Ithanga Mts., 38, 40, 41, 94 ; fauna, 220, 221, 223, 224, 229
 Iveti Mts. : *see* Ulu hills
 Ivory, 220, 289, 296, 447-448 ; exports, 457, 459, 460, 475
 Ivory-nut tree : *see* Dom palm

J

 Jackals, 210
 Jackass, 441
 Jack-fruit, 410, 537, 562, 563
 Jack-trees, 554, 555
 Jalu tribe, 233, 236, 244, 246, 247, 249, 265, 463
 Jambangome, 535, 537, 539
 Jambangome Creek : *see* Kingoji Bay
 Jamok, 372
 Jamsi, En : *see* Njemps tribe
 Jangwani : *see* Chwaka
 Japan, trade with, 456
 Japanese plums, 410
 Jara, 79
 Jarrah, 192
 Java, trade with, 455
 Jebir, 391
 Jello, 376
 Jenner, A. C. W., 504
 Jennets, 349
 Jerboa, 209
 Jibana : *see* Dzihana tribe, 263
 Jibana, Mt., 29
 Jibrail sub-tribe, 257
 Jiggers, chiggers, or sand-fleas, 339
 Jilore, L., 29, 352
 Jimbo R. : *see* Yimbo R.
 Jinja, 316, 318, 350, 364
 Jinja-Namasagali railway, 350
 Jinrickshaws, 302
 Jipe, L., 11, 12, 34, 92, 354-356, 358, 487, 499
 Jombais Mts., 387
 Jombeni (Nyambeni) Mts., 28, 39, 40, 49, 50, 89, 100, 265, 363, 392
 Jombo, Mt., 351
 Jomru R., 280
 Jongwe, 533
 Joreh (or Chore) district, 78, 79, 253, 292, 390
 Juba Is. : *see* Bajun Is., 294
 Juba R., 15, 18, 22, 25, 78, 80, 81, 90, 127, 132, 178, 179, 217, 218, 223, 234, 252, 254, 255, 295, 297, 299, 321, 346, 350, 378, 379, 391, 442, 462, 489, 491
 Jubaland and Afmada Road Tramway, 375
 Jubaland Province, 18, 30, 175, 178, 216, 222, 240, 291, 295, 432, 465, 504, 505

Jubaland Prov. (*cont.*):
 administrative divisions, 581
 agriculture, 395, 397, 408, 417, 418, 432
 camel disease, 442
 climate, 130-132
 communications, 346-349, 369-380
 economic conditions, 381, 390-392
 fauna, 202, 205, 210, 220, 225, 227, 228, 231
 fisheries, 449, 450
 forest, 180
 geology, 91
 health conditions, 321, 330, 332-334, 336, 343, 344
 live stock, 433, 436, 442, 446, 464
 native population, 234, 250, 254, 436, 504
 physical features, 77-84
 Jubissa, Gara, 14
 Judicial Department, 471
 Juja, 360, 361
 Jumbo, 299
 Jumping hare: *see* Jerboa
 Jungle, 179
 Jurassic shales, 85, 87, 88

K

Kabarnet, 62, 157, 158, 366
 Kabete, 177, 301, 341, 345; experimental farm, 399, 411, 413, 418, 443, 445
 Kabras, 266
 Kabwira, 335
 Kacheliba, 367, 368
 Kadimu, 269, 320
 Kadimu Bay, 71, 320
 Kadipelo, sub-division of the Semi tribe, 269
 Kagera R., 167

Kagoma R., 98
 Kahe, 313, 356
 Kaimosi, 366, 368
 Kaisut desert, 371
 Kajiado, 42, 350, 359
 Kakamega 186, 366, 425
 Kakamega Forest, 72, 186
 Kakamega tribe, 266
 Kaki tribe, 268
 Kalacha oasis, 84, 374
 Kalachonyo tribe, 268
 Kalama, Mt., 207
 Kalifi R., 22, 27
 Kalongol, Mt., 77
 Kamagambo, 392
 Kamagambo plain, 70, 119
 Kamalamba: *see* Awakabras
 Kamatia-escarpment, 56, 62-64, 67, 73, 76, 103, 106, 157, 261, 366, 367, 389
 Kamasia (*or* Tuken) tribe, 237, 245, 260, 261
 Kamba highlands, 127
 Kamba tribe: *see* Akamba
 Kambesi, 215
 Kami tribe: *see* Gemi
 Kamiti plains, 418
 Kamiti R., 98
 Kamnerok, L., 62
 Kampala Port, 318
 Kangani: *see* Fufuni
 Kanju: *see* Cashew
 Kanu (*or* Kidobo) tribe, 268
 Kapiti, 309
 Kapiti (*or* Kaputei) plains, 43, 59, 91, 95, 97, 114, 173, 184, 219, 257, 309, 359, 384; fauna, 209, 231
 Kapiti plains station, 361
 Kapok: *see* Silk cotton tree
 Kapsabet, 305, 312, 366
 Kapsaret Forest, 199, 425
 Kaptumo, 312

Kaputei plains: *see* Kapiti plains
 Kaputei, division of the Masai, 257
 Kapwaren Forest, 186, 195
 Karagwe, 166
 Karamojo sheep, 436
 Karamojo tribe, 237
 Karoli oasis, 84, 374
 Karungu, 69, 160, 319, 336; communications, 318, 319, 369
 Karungu Bay, 68-70, 118, 119, 122, 319
 Karura, 425
 Karuri (chief), 361
 Karuris: *see* Kororis
 Kasagunga range, 68
 Kasigau hill, 354, 355
 Kasut desert, 83
 Katanga R., 360
 Kathi's courts, 516
 Kathita R., 49
 Kau, 27, 287, 489
 Kauma tribe, 263
 Kaurao wells, 78
 Kauro, 84, 370, 371
 Kaviemit, section of Lago tribe, 261
 Kavirondo district, 70, 72-74, 111, 122, 173, 182, 319; North, 70, 71, 72, 96, 115, 216, 230, 581; South, 115, 160, 216
 agriculture, 399, 407, 408, 412, 414, 418, 421
 climate, 127
 communications, 348, 368
 economic resources, 389-390
 fauna, 213, 214, 219, 220, 224
 health conditions, 331, 336, 342, 344, 345
 live stock, 433
 population statistics, 581
 tribes, 68, 233, 236,

244, 247-249, 258,
265-269, 315, 318,
325, 335, 339, 394,
395, 462, 466-468,
477
Kavirondo Gulf, 13, 66,
67, 70, 72, 114-118,
265, 268, 269, 307,
319, 320, 368, 505
Kavirondo plains, 183,
312
Kawampuli, 335
Kebandiko, 527
Kedong, 220, 451, 505
Kedong plain, 109
Kedong R., 53, 109, 114,
115
Kedong valley, 103, 221,
364, 393
Kegomacha, Ras (Kigo-
masha), 542
Keite R., 361
Kekupe, 115
Kenani station, 93, 357
Kendu, 68, 70, 117, 307,
368
Kendu Bay, 68
Kenya Colony :
administration, 470-
480, 499-500
administrative divi-
sions, 581
agriculture, 394-399
animal products, 444-
448
area, 11, 381, 478
banks, 465
climate, 26, 70, 74, 83,
87, 91, 124-173,
292, 302, 316 ;
meteorological
tables, 583-641
communications, 346-
380
contribution towards
cost of the war, 476
currency, 479
economic crops, 400-
423
economic geography,
381-393
education, 276, 301,
396, 478-479

fauna, 202-232
fisheries, 448-450
forest products, 423-
430
frontiers, 11-15, 499
geology, 85-123
Governor, powers of
the, 470, 471
health conditions, 321-
345 ; Ordinances
and Rules concern-
ing, 326-329
history, 481-508
Home Government,
supreme authority
of, 470
imports and exports,
289, 296, 452-461 ;
duties, 475 ; statis-
tics, 459
industries, 394-451
inland towns and
settlements, 299-
314
justice, 473-474
land tenure, 477-478,
506
live stock, 432-444
local central govern-
ment, 470-471
manufactures, 464-
465
mineral resources,
450-451
native population,
233-269
physical geography,
11-84
population, 581
ports and coast towns,
270-299, 315-320
provincial govern-
ment, 471-472
revenue and expendi-
ture, 474-476
roads and tracks, 347-
380
situation, 11
stock-breeding, 430-
432
trade, 315, 452-464
vegetation, 173-201
waterways, 346-347

weights and measures,
480
Kenya, Mt. (Kirenyaga)
17, 30, 37, 39-41, 44-
49, 94, 96, 99, 100,
127, 152, 153, 174,
175, 186, 189, 190,
197, 221-225, 227,
228, 231, 232, 234,
235, 260, 262, 264,
265, 304, 309, 312,
340, 341, 361, 484
Kenya plain, 184
Kenya Province, 96,
100, 198, 304, 305,
309, 312, 362, 381
administrative divi-
sions, 581
climate, 127, 146, 147,
152, 153
communications, 348,
362, 365
economic conditions,
387
fauna, 219-225, 227-
229, 231, 232
forest, 186, 193, 191,
199, 218-220, 387,
424, 430 ; areas of
principal trees, 193-
194 ; stations, 193
health conditions, 322,
330, 332-334, 336,
338, 340
native population,
234, 260, 262, 264,
265, 463
population statistics,
581
taxes, 475
vegetation, 182, 185,
189
Kenya, South, 193
Kenya, West, 45, 153,
154, 193, 348, 420,
425, 431, 436
Kepsteddi (chief), 261
Kerauwi oasis, 84, 374
Kericho, 65, 305-306,
368, 388, 406 ; clim-
ate, 161, 162, 600-605,
640
Kerio Post, 367

- Kerio (or Ndo) R., 62, 76, 77, 226, 367
 Kerio (or Ndo) valley, 73, 103, 106, 110, 259, 262, 389
 Kerut (or Wei Wei) R., 13, 76, 77, 367
 Kestrels, 211
 Khalid, 574
 Khalifa, Seyyid, 490, 503, 578
 Khojas, 512
 Khoro tribe, 268
 Kiamboni, Ras : *see* Dicks Head
 Kiambu, 98, 306, 361
 Kibele, 521
 Kibibi, L. : *see* Solai, L
 Kibigori, 67, 113, 117, 312, 366, 389, 390, 417
 Kibish R., 103
 Kibo crater, 96
 Kiboko, 213
 Kiboko R., 36
 Kiboko swamp, 306
 Kibondei Mzungu, 522
 Kibos, 114, 117, 164, 165, 390, 399, 417; experimental farm, 399
 Kibui, 94, 393
 Kibwele district, 522
 Kibwezi, 36, 37, 40, 98, 95, 127, 134, 135, 264, 343, 361, 384, 393, 418
 Kichangani, 533
 Kichangani Bay, 533
 Kidobo : *see* Kanu tribe
 Kidongai camp, 359, 360
 Kidongai R., 359
 Kidyu, Ras, 542
 Kiembo Point, 292
 Kigangone, Ras (or Flora Point), 281, 282
 Kigomasha : *see* Kegomacha, Ras
 Kiguguli : *see* Gungodi
 Kijabe, 103, 104, 114, 307, 361, 365, 368; communications, 307
 Kijabe, Mt., 54, 59, 60, 104, 307, 364
 Kikelelwa : *see* Awalewi
 Kikero, 313
 Kikoko : *see* Mangrove
 Kikuyu, 40, 65, 110, 302, 306, 308, 330; climate, 125, 129, 149-152, 584-629, 641; station, 303, 306, 361, 364
 Kikuyu district, 47, 112, 113, 185, 187, 389
 agriculture, 394, 412, 413, 415, 419, 421
 climate, 127, 146-148, 156
 economic conditions, 386, 387, 392
 forest, 114, 119, 206
 health conditions, 322, 342
 highlands, 127
 native population, 234, 243, 260, 306, 325, 394, 395, 443, 463, 467, 505. *See* Akikuyu
 population statistics, 581
 slavery, 502
 Kikuyu escarpment, 44, 45, 59, 61, 199, 219, 223, 225, 229, 231
 Kikuyu fowl disease, 443
 Kikuyu plateau, 41, 43-45, 47, 97, 98, 360, 386, 387
 Kikuyu R., 186, 190, 191
 Kikuyu Trading Syndicate, 306
 Kilibasi hill, 33, 89, 92, 353, 383
 Kilibei hill, 12
 Kilifi Creek, 21, 27, 32, 213, 284-285, 352; communications, 280, 285, 286, 289, 293
 Kilifi town, 285
 Kilimanjaro district : climate, 128, 144
 fauna, 219-223, 225, 226
 Kilimanjaro Forest, 36, 186, 197, 219, 223
 Kilimanjaro, Mt., 12, 17, 32, 34-36, 46, 96, 198, 199, 354, 356, 357, 484, 487, 499
 Kilima Ya Mesa, 79
 Kilindini, 20, 86, 274-280, 283, 393, 408, 412, 461, 462, 514, 576
 harbour, 20, 86, 87, 273, 277, 279, 283, 350
 pier, 277, 281, 282
 railway, 281
 station, 277, 278
 Kilindini Creek, 289
 Kilindini, Ras, 281, 282
 'Kilindini Sands', 87
 Killer-Sig, 188, 190, 196
 Kiloluma R., 40, 47.
 See Tana R.
 Kilwa, 481, 482
 Kima : *see* Green bush monkey
 Kimbo Creek, 176
 Kimoti R., 292
 Kina Kombé, 252
 Kinangop forest stations, 190, 191
 Kinangop (or Nyan-derua), Mt., 44, 47, 100
 Kinangop plateau, 60, 101, 112, 114, 365
 Kinazini, Ras, 540
 King-fish, 215, 449
 Kingfishers, 212, 550
 Kingoji Bay (Jambangome or Yambugomi Creek), 537, 539
 Kingoji, Ras, 537, 539
 King's African Rifles, 295, 302, 303, 308, 477, 573
 King-whydah, 212
 Kinsharo, 354
 Kinya, 370, 372, 373
 Kinyu villages, 537
 Kionwa, Ras : *see* Domoni, North Ras
 Kipange stream, 529
 Kipchoriet R., 67
 Kipengeleni, Ras, 533

- Kipini, 22, 176, 286, 287, 486, 487, 489, 490; communications, 287, 314, 353
 Kipipieri, Mt., 60, 105
 Kipsikis: *see* Lumbwa tribe
 Kirenyaga: *see* Kenya, Mt.
 Kirk, Sir John, 571
 Kiruko, Mt., 28, 89
 Kisanga, 287
 Kisigau hill, 92
 Kisigau, Mt., 33
 Kishi Kashi, 542
 Kisii (Boma), 70, 121, 307, 330
 climate, 161, 162, 165
 communications, 307, 318, 368, 369
 Kisii district, 307
 Kisii highlands, 65, 66, 69, 70, 120, 121, 123, 184, 307, 390, 392
 Kisii tribe, 505
 Kisimkazi, Ras, 510
 Kismayu (or Refuge) Bay, 295, 296
 Kismayu (town), 25, 78, 90, 132, 295-299, 330, 331, 336, 442, 462, 504
 climate, 124, 128, 131, 135, 139, 584-585, 600, 604-609, 640
 communications, 280, 285, 286, 288, 293, 295-299, 350, 353, 375, 378
 fort, 296, 299
 harbour, 298, 487
 population, 295
 roads, 296
 trade, 296-297
 water supply, 296
 Kismayu district:
 agriculture, 395
 forest products, 427
 health conditions, 330, 331
 live stock, 443
 population, 253, 581
 rainfall, 146
 Kismayu I., 25, 298, 299
 Kisongo tribe, 257
 Kisumu (formerly Port Florence), 67, 116, 117, 122, 267, 310, 315-318, 319, 320, 501
 climate, 126, 163-165, 167, 169, 316, 584-609, 641
 communications, 274, 316-318, 368, 461
 harbour, 315, 316
 health conditions, 316, 326, 330, 333-337
 population, 315
 station, 315
 steamers, 317-318
 Township Rules (1917), 327
 trade, 315-316, 408
 water supply, 316
 Kisumu district:
 agriculture, 414, 421, 422
 climate, 146
 fishery, 448
 geology, 115
 health conditions, 326, 330, 331, 333
 population, 581
 Kisumu Province; *see* Nyanza Province
 Kisumu tribe, 269
 Kitao, Ras, 23, 287
 Kites, 211, 550
 Kito Pass, 63, 367
 Kitosh country, 71, 368
 Kitoto (chief), 268
 Kitowo hills, 12, 35, 313, 356
 Kitui, 361
 Kitui district, 37, 39, 40
 economic conditions, 307, 385, 393
 fauna, 224
 geology, 94
 health conditions, 334
 population, 235, 581
 Kitui station, 31, 32, 39, 94, 307-308; climate, 600-605, 641
 Kitumbein, Mt., 364
 Kitutu district, 70, 120, 390
 Kiu, 36, 67, 92, 220
 Kiunga, 18, 176, 291, 292
 Kiunga Mjuni, 176
 Kiungamini, 292
 Kiungani bluff, 526
 Kiuyu creeks, 542
 Kiuyu, Ras, 543
 Kivu, L., 103
 Kiwani, 521, 525
 Kiwani Bay, 525
 Kiwante Bay, 545
 Kizimkazi, 524
 Kizimkazi, Ras, 524, 532
 Kizingati I., 24
 Klipspringer, 205, 224
 Kniphofias, 184
 Knott Pass, 298
 Kojani: *see* Adamson Bay
 Kojani I., 543
 Kokota Gap, 540
 Kokota I., 540, 541
 Kokotoni, 559
 Koli-koli, or Bayardo, 449
 Komatooni, 373
 Komba: *see* Night lemur
 Kombeni Bay, 521, 525
 Kombeni, (or Hatajwa) peninsula, 525, 526
 Komoro Bulle, 375
 Konyi (or Sabaiyot) tribe, 260, 261
 Konde: *see* Vigna beans
 Kopsabet, 368
 Korokoro district, 30, 383
 Korondil, 376, 377
 Kororis (Karuris), 44, 361, 387
 Kossova: *see* Awakisii
 Kowop hill, 206
 Kraals, 248
 Krapf, Ludwig, 484
 Krawa, L., 22, 27
 Kudu, 204, 205, 207, 208, 230
 Kuffole, Gara, 14, 15

Kufile oasis, 523
 Kuja gorge, 70
 Kuja R., 69, 70, 119,
 121, 123, 336, 369
 Kuja valley, 69, 119
 Kulal Mt., 51, 58, 84,
 372, 373
 Kumbeni Bay, 545
 Kunkar, 92
 Kunono tribe, 248
 Kurde district, 79, 390
 'Kut', 369
 Kuti, 207
 Kutu (chief), 243
 Kwale I., 524, 525
 Kwamwama, 280
 Kwayama I., 25, 294
 Kwe, 371
Kweme, 177, 564
 Kwyhu Bay, 24, 290
 Kwyhu Is., 24
 Kyambu, 331, 335
 Kyambu district, 405,
 406
 Kyulu range, 35-37, 95,
 179, 206, 384

L

Labour, 197, 324, 337,
 401, 406, 418, 465-
 469, 503, 557; camps,
 325, 468
 Lado, 122
 Lago (or El Bawgek)
 tribe, 261
 La Hele Rapids, 81, 347
 Laichu, 387
 Laikipia district, 155,
 182
 Laikipia escarpment, 56,
 60, 102, 105
 Laikipia Masai, 238,
 258, 259, 262
 Laikipia plateau, 39, 47,
 48, 51, 63, 97-99, 105,
 114, 155, 173, 183,
 202, 226, 231, 258,
 345, 362, 387, 431,
 436, 505
 Laipera, 84, 373, 374
 Laishamunye, Mt., 50,
 370

Laitok Forest, 186, 197
 Lak Aboloni, 80
 Lak Bogol, 375
 Lak Dera, 78, 80, 181,
 222, 375, 376; 442
 Lak Guran: *see* Guran-
 legga R.
 Lak Jera, 80
 Lake district: *see*
 Nyanza Province and
 Victoria Nyanza
 Lako tribe, 260
 Lakoli tribe, 262, 267
 Lambermont, Baron,
 490
 Lambewa, 358
 Lamu Bay, 22, 23, 287-
 289
 Lamu district, 15, 18,
 22-25, 87, 90, 132,
 287, 290, 381, 382,
 483
 agriculture, 402
 fauna, 214
 fisheries, 215, 448, 449
 health conditions, 216,
 322, 330, 331, 334,
 339
 native population,
 239, 240
 population statistics,
 581
 products, 176, 382,
 427
 Lamu I., 22, 23, 287-288,
 289, 481, 487
 Lamu town, 23, 77, 288-
 289, 330, 331, 465,
 490
 climate, 125, 133-135,
 139, 288, 584-609,
 612-613, 641
 communications, 274,
 280, 284-286, 289,
 293, 299, 314, 350,
 353
 harbour, 289
 Lamwea hill: *see* Ngong
 hill
 Land: grants to ex-
 soldiers, 581; sale of,
 506; tenure, 477-478,
 506; trusts, 506

Land Department, 471
Landolphia, 189, 196,
 430, 548, 566
 Landowners' Associa-
 tion, 508
 Langaia, 370
 Langeteilo (or Chemo-
 rongi) range, 63
 Lango tribe, 236
 Language, 234, 236-239,
 259, 260, 262, 266
 Langueh, 318, 368
 Lanjoro: *see* Njoro
 drift
 Lansdowne, Lord, 506
 Lari, 191, 425
 Larks, 213
 Las, El, 90
 Lasamis, 83, 84, 94, 370,
 371
 Latema, Mt., 35, 356
 Latema-Reata Nek, 35,
 356
 Laterok, Mt., 77, 367
 Latham I. (Fungu Ki-
 zimbazi), 534
 Latuka language, 237
 tribe, 237
 Laundries, 464
 Law courts, 473-474
 Leases, 477, 478
 Leather exports, 458
 Lebatui plain, 77
 Leeches, 83
 Legislative Council, 471,
 500, 507, 508
 Lego tribe, 269
 Lelarak (chief), 259
 Lemon juice, 401
 Lemons, 219, 397, 400,
 402, 410, 562; wild,
 193
 Lemwusi sub-tribe, 259
 Lengeyo, Mt., 51
 Leopards, 204, 208, 209,
 232
 Leprosy, 288, 338, 541;
 leper settlements, 330,
 338
 Leprosy Ordinance
 (1913), 327, 338
 Lianas, 189, 196, 548,
 549

- Lice, 339, 552
 Lichens, 196, 198
 Lighthouses, 528, 542
 Likoni, 350
 Lily-trotter, 212
 Lime, 115, 118, 562
 Limes, 382, 397, 400, 410
 Limestone, 87, 93-95, 108, 115, 117, 118, 393, 518, 519, 524, 534, 535, 537, 543, 553
 Limoru, 308, 361, 387, 413, 419, 422; climate, 125, 128, 148-151, 584-609, 641
 Limoru Mill, 424
 Lindi, 514
 Lingah, 551
 Lingham and Grogan forest concession, 185, 195-197, 424
 Lions, 202-204, 209, 231, 309
 Litchi, 562
 Live stock, 246, 399, 432-444, 566
 Liwalis, courts of the, 474, 502
 Liwitu, 346
 Lizard, great, 550
 Loam, 112, 114, 115
 Lobelias, 198, 549
 Lobsters, 215, 449, 450
 Lodermeru, 373
 Lodermut, Mt., 83, 94, 207
 Lodwar Post, 367
 Loganberries, 410
 Loita plains, 63, 64, 66, 173, 184, 384; fauna, 202, 205, 209, 222, 223, 226, 227, 229-231
 Loiyangolani, 372-374
 Lolajonga hill, 206, 207
 Loldaika ridge, 39, 48, 100, 362, 370
 Lolleshid, 379
 Lolokwi, Mt., 51
 Lololokwi, Mt., 40
 Lololugi summit, 207
 Lomendilli (chief), 259
 Lomoton hill, 207
 Londiani, 67, 73, 110, 308
 communications, 303, 304, 308, 366, 367
 forest nursery, 425
 railway station, 74, 303, 308, 389
 Londiani district: cultivation, 409, 419
 Londiani Forest, 195, 199, 231
 Londiani-Mau Forest, 195
 Longendoti, Mt., 58
 Longido, Mt., 12, 350, 359, 360
 Longonot, Mt., 53, 54, 96, 102, 103, 107, 109, 114
 Lonkero crater, 83
 Loongarya escarpment, 66
 Loquats, 410
 Lorgosailieh (Lorgasaili), extinct crater of, 53, 102
 Lorian R., 334, 464
 Lorian Swamp, 50, 51, 78-80, 96, 101, 181, 252, 309, 312, 363, 375, 381, 390, 391; fauna, 210, 216, 217, 221, 225, 227, 231
 Lorogai: *see* Loroghi
 Loroghi (Lorogai) Mts., 48, 49, 51, 99, 227
 Lorogishu (*or* Nurgushu) sub-tribe, 225, 259
 Loroki scarp, 206
 Losidau, 373
 Losoyai R., 12
 Lostomiasis, 338
 Losuguta, L: *see* Hannington, L.
 Lougelli (*or* Ungelli) sub-tribe, 255, 259
 Love-bird, 550
 Luburua: *see* Teleki's volcano
 Lucerne, 422
 Lufangano I., 268
 Lugard, Sir F. D., 496
 Lugard's Fall, 32
 Lugga, 372
 Lugh, 80, 132, 257, 379, 391
 Lugumai, II, clan division of the Masai, 258
 Lugume sub-tribe, 255, 259
 Lukenia hills, 38, 360
 Lukos: *see* Yala R.
 Lumber mills, 424
 Lumbwa district, 65-67, 182, 305, 342
 agriculture, 388, 396, 406, 409, 412, 419
 climate, 162
 live stock, 431, 433, 439, 445
 population, 581
 Lumbwa Forest, 195
 Lumbwa town, 65, 308-309, 368, 424
 climate, 161, 162, 600-605, 640
 railway station, 65, 305, 308
 Lumbwa (*or* Kipsikis) tribe, 242, 258, 260, 262, 434
 Lumi R., 34, 313, 356, 357
 Lunatic asylum, 330
 Lung-fish, 213, 214, 448
 Lusimo R., 266
 Lusinga: *see* Rusinga I.
 Lusumu valley, 310
 Lymphangitis, 344, 388, 440, 441

M

- Mabindi Spit, 513
 Machakos district, 37, 38, 581
 cultivation, 406, 410, 415, 418
 economic conditions, 384, 385, 392, 402
 fauna, 207, 231
 game reserve, 207
 geology, 93, 94
 health conditions, 322, 324, 342

- Machakos district (*ct.*) :
 live stock, 443
 minerals, 450, 451
 Machakos hills, 37, 38, 43, 93
 Machakos R., 40
 Machakos town, 38, 39, 307, 309, 335, 479, 496, 499
 climate, 125, 127, 148-152, 584-629, 641
 communications, 309, 359-361
 Machinery, importation of, 456
 Mackenzie, G. S., 501, 502
 Mackenzie Point, 279
 Mackenzie R., 42
 Mackerel, 449
 Mackinnon, Sir William, 485, 486, 488, 490, 497
 Mackinnon Road station, 92, 144, 353, 393
 Mackongwe I., 338
 Makunduchi, 555
 Madagascar, trade with, 280
 Madagascar beans, 400
 Madoleh (Medali), 80
 Mafia I., 487, 491, 509
 Magadi, L., 52, 59, 61, 103, 104, 106-108, 363, 393, 450, 500
 Magadi Railway, 42, 43, 59, 97, 206, 350, 357, 359
 Magadi Soda Works, 278, 282, 364
 Magalia R., 55
 Magar, 376
 Magarini hill, 29
 Magarini Shambas, 286, 382
 Mageta I., 13, 71, 320
 Maggot-fly, 341
 Maghubul sub-tribe, 253
 Magnetite, 92
 Magogoni (Mgogoni), 530
 Ma'dahad, 84, 374
 Maikona, 374
 Mairothi : *see* Pinc, Indian
 Mairozi, 425
 Mairungi, 200
 Maize, 219, 247, 296, 297, 306, 308, 311, 312, 384, 388-391, 394, 395, 397, 399-401, 404, 406, 411-412, 421, 439, 553, 561; exports, 458, 459
 Maji Mazuri, 424
 Majid, Seyyid, 484, 485
 Maji-ya-Chumvi, 30
 Makindu, 30, 36, 92, 217, 222, 224, 227, 230, 335, 361, 415
 Makindu R., 206
 Makinduri : *see* Croton
 Makita : *see* Yekete-kambe, Ras
 Makongeni, 32
 Maktau hill, 355, 356
 Maktau R., 34
 Makunduchi, Ras, 531, 532
 Makungwe I., 539
 Makupa bridge, 279
 Makupa Channel, 20, 26, 87, 275, 278, 283
 Makuti, 292, 295, 404; huts, 275, 290, 291
 Makwembi R., 350
 Malaba (Malawa) R., 13
 Malakisi R., 261
 Malaria, 180, 216, 278, 316, 319, 323, 324, 333, 337, 551
 Malawa R. : *see* Malaba R.
 Malindi Bay, 449
 Malindi district :
 climate, 132-133, 146
 cultivation, 382, 427
 fisheries, 448, 449, 465
 population, 239, 286, 581
 vegetation, 352
 Malindi town, 21, 26, 215, 217, 285-286, 338, 408, 413, 465
 climate, 126, 128, 133-135, 139, 584-609, 612-613, 641
 communications, 280, 286, 289, 299, 352
 harbour, 286
 Malka (watering-place), 353
 Malka Dakka, 380
 Malka Murri, 14, 15
 Malka Re, 380
 Malka Sala, 380
 Malka Waja, 375
 Mallard, African, 212
 Mamba : *see* Lung-fish
 Mambrui, 21, 286
 Mammals, 202, 207-210
 Mamolo R., 28, 29
 Manda Bay, 23, 24, 289-290, 298, 489
 Manda I., 22, 23, 176, 287-289, 481
 Manda (or Vaita), Mt., 33
 Manga escarpment, 70, 120, 121, 307, 390
 Mangapwani (Mungopani), 528
 Mangle, Mt., 29, 32, 352
 Mango (fruit and trees), 177, 274, 275, 394, 395, 410, 522, 524, 525, 532, 533, 537, 553-555, 562
 Mangolds, 423
 Mangrove, 18, 19, 22-24, 176, 200, 272, 287, 289, 291, 292, 382, 426, 427, 525, 528, 538-541, 544, 545, 552
 bark, 289, 383, 430; exports, 459, 460
 forests, 382; royalties on produce, 475
 poles, 382, 424, 426; exports, 460
 swamps, 173, 176, 199, 200, 291, 350, 351, 534, 544, 545
 Manioc, 395, 543
 Mapopwe : *see* Chwaka
 Mara Post, 365, 368
 Mara R., 13, 64, 66, 110, 343
 Mara valley, 63, 69

- Marabou stork, 212
 Marabouts, 204
 Maragoli, 335
 Maragoli: *see* Awalakoli
 Maragoli hills, 70, 71, 116, 267, 269
 Maragua R., 45
 Maragwet tribe, 245, 260
 Marama, 258
 Maraquet district: population, 581
 Marble, 93
 Marehan country, 78, 379, 391
 Marehan tribe, 247, 250
 Maren, 351, 353
 Mariakani sandstone, 88
 Marich Pass, 75, 76, 367
 Marine fish, 214, 215, 550, 569
 Marisi, 79
 Marittima Italiana: *see* Italian East African Line
 Marmaret, Mt., 47
 Maroto Post, 367
 Marsabit, 217, 330, 331, 339, 371, 372; communications, 350, 374
 Marsabit district, 82-84, 178, 234, 254, 309, 343, 363, 370, 391
 Marsabit Forest, 83, 186, 371, 392
 Marsabit, L., 371, 372
 Marsabit, Mt., 83, 101, 181, 186, 207
 Marsh-warbler, 213
 Marti (*or* Erimba) plateau, 79, 96, 101, 181, 374
 Marunga, 357
 Masai people, 233, 235-238, 240-243, 245-249, 359, 430, 433, 434, 436, 440, 444, 463, 466, 467, 485, 505
 geographical and clan divisions, 257-258
 language, 238, 239
 social organization, 240-242
 Masai plains, 42, 348, 360
 Masai Reserve, 258, 312, 365; health conditions, 217, 343
 live-stock industry, 431, 432, 437, 444, 463
 population, 581
 Masai sheep, 436, 463
 Masai Turkana group, 238
 Masawa: *see* Awake-tosh
 Masingini ridge, 520, 521
 Masol, Mt., 76, 77
 Masongoleni, 36
 Massariani peninsula, 532, 533
 Massure sub-tribe, 257
 Masters and Servants Ordinance (1910), 468
 Matapato country, 220
 Mat-bags, 289
 Matches, importation of, 456
 Mathew range, 40, 51, 186, 207, 209, 221, 373; forest, 186
 Mathews, Sir Lloyd, 572, 574
 Mathioya R., 45, 98
 Matimba R., 531
 Matonko: *see* Custard apple
 Matumbato Masai plains, 12, 42, 359
 Matumbeni I., 539
 Mau escarpment, 52, 55, 61-64, 104, 185, 190, 206, 219, 222-224, 226, 229, 303
 Mau forests, 64-66, 72, 112, 113, 173, 185, 186, 189, 194-196, 212, 220, 231, 348, 388, 389, 424
 Mau Narok (*or* Black Mau), 64
 Mau plateau, 56, 64, 67, 104, 110, 183, 232, 386, 488, 505
 Maungu hill, 33, 92, 353
 Maungu station, 92, 353
 Mauritius, trade with, 455
 Mawenzi crater, 96
 Mazareni, 351
 Mazeras, 26, 28, 29, 88, 176, 312, 313, 352, 399, 413
 Mazeras sandstone, 88
 Maziwva Ngombe, 543
 Mazi ya-Chumvi sandstone, 88
 Mazrui clan, 482, 483; revolt of, 497-498
 Mbagathi, 361
 Mbale, 355, 368
 Mbaraki Creek, 281, 282
 Mbarta plains, 259
 Mbatian (chief), 242
 Mbazi: *see* Congo pea
 Mbembakofe: *see* Teak
 Mbere tribe, 264
 Mbweni Bay, 526
 Mbita passage, 69
 Mtuyo: *see* Baobab
 Mbuyu, Ras, 526
 Mbuyuni, 34, 355, 358, 375, 376
 Mbuzini, 486
 Mchangamle (Mchanga), 524
 Mchangamwe, Ras, 283
 Mchenganazi Pass, 543
 Mdi forests, 186
 Mdoni, 541
 Mealies, 453
 Mear Tomb, 298
 Meat, 444-445, 453
 Medali: *see* Madoleh
 Medical Department, 471
 Medical Officers, 328, 329, 331, 472
 Melindi, 182
 Melka Waja, 80
 Melons, 533
 Melon-tree: *see* Paw-paw
 Menai Bay, 524-526
 Menelek II, 499
 Menengai, Mt., 55, 107
 Mengana (*or* Aitayok) clan, 258

- Mengo**: climate, 169, 584-585, 590-605, 608-611, 618-629, 640
Merille, 84, 370, 371, 373
Merino wool, 443
Merka, 487, 490
Merti, 254, 256
Meru, 40, 49, 246, 309-310, 336, 438, 464
 climate, 153, 154
 communications, 51, 305, 309-310, 312, 350, 359, 361, 362, 370, 375
Meru district, 49, 182, 185, 220, 387; population, 49, 259 581
Meru tribe, 245, 249, 265, 324, 467
Mesale I., 539, 540
Messageries Maritimes, 282, 576
Metamala, 70, 119, 122
Meteorological stations, 640-641; observations, 584-641
Mfudu, 81, 180, 378
Mfumbiro volcanoes, 103
Mfwanganu I., 13, 68
Mgahanya (chief), 267
Mgoa: see Rubber
Mgoa village, 19, 271
Mgogoni: see Magogoni
Mgombe (or Chiombe, or Chiumbo) crater, 50, 160
Mqongonze, 200
Mhogo: see Cassava
Mica, 89, 91-93, 100, 117, 392, 450-451; exports, 495; mines, 459; royalties, 475
Mice, 208-210
Michamwi peninsula, 511, 545
Midgan tribe, 233
Mijjertein, division of the Herti tribe, 253
Mikindani beds, 518-520, 534
Military Department, 471
Military forces, 303, 477; garrisons, camps, and stations, 273, 295, 296, 361; hospitals, 303, 330, 445; railway, 354; road, 378
Milk and milk-supply, 247, 329, 433-435, 445
Millet, 247, 286, 306, 367, 382, 384, 390, 394, 395, 412, 421, 553, 555, 561; exports, 458, 459; wild, 549
Mills, 309
Mimosa, 45, 296
Minengani R., 486-487
Mineral resources, 392-393
Miombo, 170
Miriu: see Sondo R.
Missions and missionaries, 274, 330, 484, 498, 502, 578, 642; schools, 276, 479
Mizi Miombe (or Three Feet Hill), 537
Mianji, 320
Mkahakuha: see Bastard cedar
Mkanda: see Mangrove
Mkaoni, 338
Mkarambiki, 201
Mkindu: see Date palm, wild
Mkisi: see Mullet
Mkita: see Yekete-kambe, Ras
Mkiwani Chappel, 543
Mkoani district, 537
Mkoani Post, 539
Mkoi: see Teak, Ibran
Mkoko: see Mangrove
Mkokotoni Bay, 524
Mkokotoni district, 522, 545, 554
Mkokotoni harbour, 529, 532
Mkokotoni hill, 522, 529
Mkokotoni plain, 529
Mkokotoni village, 518, 521, 530, 533
Mkomazi R., 358
Mkombo mayo, 200
Mkongoroni, 531
Mkonumbi, 338, 353
Mkumbuu peninsula, 536, 539, 540
Mkunga, 214
Mkuruwe: see Albizia
Mkwadju: see Tamarind
Mlalachi: see Chestnut, Cape
Mlango Kipungani, 23, 287
Mlango Mkanda, 23, 289, 290
Mlango Nkumumbi, 23
Mlegi R., 263
Mnarani, 285
Mnazi: see Coconut
Mogari Is., 69
Mogdishu, 298, 299, 487, 490
Mogogodo (or El Mwesi) tribe, 261
Mohair, 447
Mohammed Garabi (chief), 251
Mohammed Rer, sub-tribe, 251, 254
Mohammed Zubeir sub-tribe, 251
Mohammedan law, 275, 473, 477, 517, 577
Mohammedans, 239, 249, 254, 255, 474, 572
Mohuru promontory, 13, 69, 119
Moile, Mt., 83, 94
Moinyere: see Jarrah
Mokesen clan, 258
Molelyan clan, 258
Mole-rats, 210
Molo, 64, 111, 424, 436: climate, 161, 162
Molo, El: see South I.
Molo Forest, 199
Molo, Lower, 402
Molo R., 56, 65, 73, 365, 366, 389
Molo valley, 73, 311, 348, 411
Mombasa (town), 19, 20, 21, 26, 28, 86, 176, 203, 217, 273-280,

- 341, 347, 404, 445,
457, 462, 473, 479,
482-485, 492, 497,
498, 501, 502, 514,
576
climate, 125, 126, 128,
129, 139, 141, 584-
629, 640
communications, 274,
277-286, 288, 289,
299, 314, 315, 349-
351, 515
fisheries, 448, 449,
465.
fort, 276, 277, 279
Government build-
ings, 275
harbour, 22, 86, 87,
275, 279, 280
health conditions, 278,
326, 330-333, 335,
337, 338
institutions, 275-276
native population, 239,
274-275
port, 279, 461
railway station, 277,
280
Township Rules
(1917), 327
water supply, 279,
352
Mombasa, Crown of
(hills), 88
Mombasa district, 413,
425
climate, 134-136, 146
fauna, 213, 215, 216,
228
health conditions,
322, 323, 330-332,
343
population, 581
Mombasa I., 20, 22, 86,
87, 216, 273, 274,
275-283, 339, 481
climate, 278
health conditions, 278
vegetation, 274
Monadknocks, 91, 92
Mongoni Creek, 24, 290
Mongoose, 209
Monitor lizard, 213
Monkeys, 207, 208, 219
Monsoons, 293, 449, 553
Monyoni, Mt., 35
Moorland, or Alpine,
zone, 174, 175, 198-199
Morendat, 310
Morendat R., 55, 60, 105,
114, 365
Moro tree, 185
Moshi, 313, 354, 356-
360; climate, 145-
148, 584-629, 634, 641
Moslems: see Moham-
medans
Mosques, 529
Mosquitoes, 170, 214,
216, 288, 314, 321, 323,
325, 328, 329, 331, 333,
341, 344, 551
Mosquito-netting, 333
Mosses, 196, 198
Mother-of-pearl oyster,
551, 570
Motor cars, 375, 376
launches, 448, 465
traffic and roads, 305,
306, 313, 314, 348,
350, 352, 354, 357-
365, 370, 376, 378
Mountain bamboo, 190
Mountain everlasting,
198
Mountain hyrax, 208
Mountain zone; health
conditions, 332-334,
336, 339, 340
Moyale (or Fort Hanning-
ton), 15, 82, 96, 101,
256, 350, 372, 375-380,
464
Mozambique, 224, 481,
482; trade with, 291
Mpera murtu, 201
Mpera mwitu, 200
Mpingu: see Ebony
Mpira: see Rubber
Mpunga: see Rice
Mreri, 279
Mrima, Mt., 28, 89
Msafeli: see Sour-sop
Msambweni, 350
Mshame: see Horse
chestnut
Msufi, 565
Msuka Bay, 542
Mtai, 28
Mtama, 394, 412
Mtandarusi: see Copal
Mtangani, 543
Mtanga Ya Papa, 298
Mtanganyiko, 285, 352
Mtapwa, 283
Mtarakwa: see Cedar
Mtende, 532
Mtepe, 291
Mtikani: see Dye-wood
Mtito Andei, 95, 357
Mtito Andei R., 357
Mtonga, 281, 282
Mtsapuni R., 263
Mtundu, 187
Mua hills, 38, 360, 361,
384
Muaka Singe, Ras, 20,
273, 280, 281
Muansa, 170; climate,
169, 170, 172, 584-
628, 632, 640
Muchorowe, 187
Mud-fish, 214, 448, 551
Muddo Erri, 380
Mudirs, courts of the,
474
Mudstone, 106
Mueri: see Stinkwood
Mueza Creek, 281
Mugaita: see Beech,
Boer
Mugambwa, 201
Muhindi: see Maize
Muho, 201, 425, 426, 428
Muhoroni, 67, 111, 117,
122, 224; climate,
164, 165, 600, 62-
605, 640
Muhoroni district, 406
Muhu, 187
Muhugu: see Sandal-
wood
Muhuru, 201
Mukaa, 450
Mukao, 187, 188, 194,
426
Mukarara: see Euphor-
bia
Mukongoro, 193, 194

- Mukungune, 273
 Mulberry, 554
 Mules, 254, 357, 369, 371, 372, 392, 441
 Mullet, 215, 449
 Mumia (chief), 268
 Mumias, 70, 72, 115, 116, 258, 266-269, 310, 364, 366, 367; climate, 164, 165, 169, 600-605, 640: communications, 13, 310, 316, 320
 Mumias district, 395, 421, 422
 Mumin Hassan, Rer, division of the Aulihan, 252
 Mumoni Mts., 39, 41, 94, 264
Muna: see *Poon*, Ibean
 Mundane range, 29
Munderendu: see Iron-wood, white
 Mundini, Ras, 272
Mungarima: see *Plane*, Cape
 Mungopani: see *Mangapwani*
 Municipal Corporations Ordinance of 1909, 472
Muno, 201
Munyenge: see *Box*, grey
 Muram, 113, 118, 386, 390
 Muronaithe: see *North I.*
Muroroo: see *Chestnut*, Cape
 Murulle sub-tribe, 257
Musaizi: see *Pillar-wood*
Musangera: see *Yellow-wood*
Mushami, 189
Musharage: see *Iron-wood*
 Muskat, 274, 286, 482-484, 571
 Mussola sub-tribe, 255, 259
 Mustard-tree, 181
 Mutaida (chief), 256
Mutamayu: see *Olive*, grey
Mutanga: see *Safraan*
 Mutaozu, 193
Mutati, 189, 200
Mulendera, 193, 201, 428
Muthisioi, 200
 Mutton, 298, 436, 437, 444
Mutukuyu, 201
Mutuma: see *Wing-wood*
Mutundu, 193, 200, 426
Muwele, 188
 Muyuni, 530
Muzaili: see *Camphor*
Muzegeta, 193
Muziga: see *Green-heart*
Mvuli, 200
Mvumo: see *Deleb palm*
 Mwachema R., 350
 Mwachi, 425
 Mwachi R., 28, 29, 86, 88, 283
 Mwamba R. 86
 Mwana Kombo R., 521, 528
 Mwana Mwana I., 532, 533
 Mwanda Bay, 554
 Mwanda lagoon, 519, 522, 528, 545
 Mwanda, Ras, 528, 529
 Mwanda village, 529
 Mwanga. King of Uganda, 296
 Mwangoni hill, 532, 33, 555
 Mwani hills, 95
 Mwanza, 318, 350
 Mwatate: climate 128, 144-146, 584-609, 614-615, 641
 Mwatate R., 355
 Mwatate valley, 383
Mwazazia, 194
 Mweani, 357
 Mwele, 351, 352, 382
 Mwele hill, 26, 28, 89, 353, 393
 Mwema R., 19, 351
 Mwemba I., 530
 Mwera depression, 519-522, 525
 Mwera R., 519, 520, 522, 526, 565
 Mweru district, 450
 Mwesi, El: see *Mogogodo*
 Mwimbe tribe, 264
 Mwiria clans, 265
 Myiri desert, 42
 Mzima, 330, 355, 356
 Mzima R., 357
 Mzimili, Ras, 281
 M'inga Mzinga: see *Zingwe Zingwe R.*
 Mzio, 200
Mzuchai: see *Cork*

N

- Nahagan sub-tribe, 255
 Nairobi (town), 43-45, 97, 98, 199, 217, 246, 276, 299-303, 426, 428, 429, 434, 463, 473, 499, 505, 507
 administration, 299, 302
 branch railway, 313
 buildings and institutions, 300-301
 climate, 128, 129, 149-152, 302, 584-611, 616-629, 641
 communications, 207, 277, 297, 300, 305, 306, 312-314, 345, 347, 348, 350, 357, 359, 360-365
 education, 478, 479
 health conditions, 302-303, 326, 328-336, 472
 industries, 424, 427, 432, 444, 464
 population, 250, 300
 Township Rules (1917), 327
 water supply, 302, 345
 Nairobi coffee, 407

Nairobi district :

- agriculture, 396, 399, 406, 407, 410, 423
- fauna, 214, 227
- health conditions, 322, 324, 326, 330, 331, 342
- live stock, 445
- population, 581
- Nairobi Forest, 183, 186, 187, 189
- Nairobi hill, 113, 300
- Nairobi R., 45, 300
- Naivasha, 60, 106, 108, 217, 310-311, 436, 439, 463
- climate, 125, 128-130, 155-160, 584-605, 608-609, 640
- communications, 310, 359, 362, 364, 365
- experimental farm 310, 399, 431, 435, 437, 440, 441, 446, 447
- Naivasha district :
 - agriculture, 399, 415, 422
 - climate, 146
 - communications, 348, 365
 - economic conditions, 388, 393
 - fauna, 212, 213
 - forest, 199
 - health conditions, 322, 323
 - live stock, 431, 443, 445-447
 - population, 581
- Naivasha, L., 17, 52, 54, 56, 57, 60, 62, 105, 107, 109, 115, 184, 222, 231, 393
- Naivasha Province, 182, 303, 308, 310, 311, 499, 500, 505
- administrative divisions, 581
- climate, 155
- health conditions, 334
- population, 581
- taxes, 474

- Nakuru (town), 55, 308, 311, 330, 331, 341, 342, 478
- communications, 311, 365, 366
- projected railway, 304, 311, 348, 367, 389
- water supply, 311
- Nakuru district, 114, 183, 311
- agriculture and live stock, 311, 388, 402, 408-411, 419
- health conditions, 330, 331
- population, 581
- Nakuru, L., 52, 55, 56, 62, 104, 107, 199, 222, 231
- Namanga R., 42
- Namaqua dove, 211
- Nandi, 312, 330; climate, 125, 128, 129, 155-157, 159, 584-611, 640
- Nandi district, 65, 183, 262, 312
- agriculture and live stock, 388, 407, 433
- forests, 73, 195, 196, 231, 407, 430
- geology, 96, 111, 116
- physical features, 73
- population, 581
- tribal reserve, 312
- Nandi escarpment, 67, 70-73, 111, 219, 266, 268, 366
- Nandi tribes, 233, 234, 237, 238, 241, 242, 244-247, 258, 260-263, 339, 434, 505
- language, 234, 237-239, 260, 262
- social organization, 242
- Nanyuke R., 48
- Nasser, 122
- Nassoon Point : *see* Upembe, Ras
- National Bank of India, 301, 311, 315, 465, 513, 517

- National Bank of South Africa, 301
- Native agricultural schools, 396, 399
- clothing, 249
- councils of elders, 474
- cultivation, 182, 247, 258, 261, 266, 383, 386, 390, 394-396, 399, 400, 402, 403, 407, 408, 412-414, 421, 423, 429, 463, 504, 553, 554, 556
- customary law, 473, 474, 503
- customs, 241, 243-245, 259, 503
- death-rate, 324
- dug-out, 569
- education, 479
- family life, 245
- fishermen, 569
- food, 325
- forest clearings and cultivation, 186, 187
- headmen, 472, 503
- health conditions, 324-325, 330, 332, 338, 339
- homesteads, 242, 244
- hospitals, 275, 337
- huts 25, 187, 295, 325, 333, 339, 404, 426; hut tax, 474, 503
- industries, 465
- intoxicants, 403
- labour, 264, 324, 397, 400, 401, 406, 412, 465-469, 507, 579; commission on (1912-13), 324, 467
- land tenures, 397, 477
- live stock, 341, 345, 432-438, 444, 446, 567
- mode of subsistence, 246-248
- police, 307, 313, 314, 319, 476
- poll tax, 474, 503
- population, 233-269; statistics, 581;

- Native population (*ct.*):
 treatment of, 466–469, 472, 503–507
 races, administration of, 503–505
 reserves, 187, 217, 304, 306, 308, 312, 343, 365, 444, 462, 463, 465, 466, 472, 475, 477, 478, 504, 505; *see also* Masai Reserve
 shambas, 548, 555–557
 social organization, 240–248
 tobacco, 418, 566
 trade, 432, 462–463
 tribunals, 473, 474
 villages, 244, 248, 259, 261
 weapons, 113, 185
 Natron, L., 12, 17, 52, 197, 221, 230, 364, 450
 Navigation: *see* Waterways
 Ndara hills, 32–34, 93, 335, 355, 384
 Ndasegara tableland, 13, 63, 197
 Nda, 24
 Ndawe hill, 357
 Ndi hills, 33, 93
 Ndia tribe, 244, 264
 Ndo R., and valley: *see* Kerio
 Ndoto, Mt., 40, 51, 373
 Ndsoruni R., 285
 Nduis, 258
 Ndungu, 40
 Negroid tribes, 233, 235–236, 239, 244, 245, 247, 263–270
 Neketet, section of Lago tribe, 261
 Nervous complaints, 338
 Neuwied (Ukerewe), climate, 129, 169–171, 584–617, 640
 Ngambo, 513
 Ngao, 27
 Ngara Rongei, 303
 Ngare Narok, 365
 Ngare Ndare R., 49
 Ngelema Bay, 539
 Ngezi Forest, 536
 Ngofu: *see* Euphorbia
 Ngoma (*or* Ngoma mek) tribe, 260, 262
 Ngomeni, Ras, 21, 22, 39
 Ngong, 43, 303, 312, 364
 Ngong (*or* Lamwea) hill, 43, 53, 59, 206, 359, 364
 Ngong R., 206
 Ngongo Bagas, 104
 Ngongo, Mt., 220, 221
 Ngoronet, 373
 Ngorongobit R., 45, 362
 Nguessi sub-tribe, 259
 Ngulu Gap, 358
 Ngurangani, 351
 Nguru: *see* King-fish
 Nguruman escarpment, 13, 61
 Nguruman Masai tribe, 61
 Nguzeru, 47
 Nguzo, 200
 Nife (*or* Nyife) tribe, 269
 Night adder, 214
 Night lemur, 549
 Nile R., 15, 75, 484, 485
 Nilotic language, 236, 238
 Nilotic peoples, 233, 236, 244, 246, 247, 249, 265, 268–269, 463
 Nimaan, 379
 Nimule, 350
 Njao Gap, 542
 Njao I., 542
 Njata, 358
 Njemps, steppes of, 56, 65
 Njemps (*or* En Jamsi) tribe, 248, 258
 Njemps villages, 258, 259
 Njoro, 62, 356, 388, 389, 410, 424, 425
 Njoro district: cultivation, 419, 420
 Njoro (Lanjoro) drift, 355
 Njoro R., 55, 62
 Njoro Delamare, 371, 372
 Nomad tribes, 235, 240, 442, 504
 North Channel, 298
 North I. (*or* Muronaithe), 58
 Northern Frontier District, 18, 30, 178, 505
 communications, 348, 349, 369–380
 economic conditions, 381, 391–392
 live stock, 392, 433, 444, 447, 464
 native population, 234, 253, 254, 258
 physical features, 78–84
 population statistics, 581
 Norway, trade with, 455
 Nregi, 369
 Ntende, 369
 Nuki R., 192
 Nullahs, 82
 Nungwe, Ras, 510, 529, 530
 Nungwe village, 530
 Nurgushu: *see* Lorogishu
 Nutmeg, 564
 Nyabarai sub-tribe, 259
 Nyakach Bay, 68
 Nyakach tribe, 269
 Nyakatih country, 268
 Nyakuru district, 336
 Nyambeni: *see* Jombeni Mts.
 Nyanderua Mt.: *see* Kinangop, Mt.
 Nyando (*or* Bagamoyo) R., 64–68, 308
 Nyando valley, 66, 72, 111
 Nyangnori tribe, 262
 Nyangoris R., 66
 Nyanza Province, 182, 183, 315, 463, 499, 505
 administrative divisions, 581

- cultivation, 390, 394-396, 406, 411, 414
fauna, 226, 230
health conditions, 332-336, 338, 340
population, 581
See also Victoria Nyanza
- Nyeri, 48, 94, 98, 312
climate, 153, 154
cultivation, 387, 406
health conditions, 322, 332, 342
population, 259, 581
taxes, 475
- Nyeri hill, 44, 199
Nyeri plains, 45-47, 65, 97-100, 112, 114, 387
communications, 99, 305, 310, 312, 314, 361-363, 365, 370
forest nursery, 312, 425
health conditions, 332
local trade, 438, 463, 464
- Nyife : *see* Nife tribe
Nyika, *or* desert, 15, 16, 40, 42, 51, 90, 91, 94, 488
area, 381
climate, 383, 384
communications, 353
economic conditions, 381, 383-384, 397
fauna, 208-211, 221, 223, 225, 231
geology, 90-95
health conditions, 332, 333, 336
physical features, 30-35
vegetation, 173, 175, 176, 178-182
- Nyiri *or* 'Swamp' desert, 35, 36, 179, 220
Nyiro. Mt., 206
Nyngu, 448
Nyuki : *see* Bees, wild
Nyuna, 215
Nyuni I., 298
Nzaoi, Mt., 38, 361
- Nziu R., 391
Nzoia R., 71, 72, 74, 75, 116, 186, 209, 214, 229, 266-269, 310, 367, 368, 388
Nzoia valley, 268, 388
- O
- Oak, 425
Oats, 422
Observation camps, 329
Observation Point, 538
Oda Boru Ruva : *see* Galanaba I.
Odera Ululo (chief), 268, 269
Ogadein tribe, 247, 251, 297, 504, 505
Oil, 453 ; exports, 459
Oil-cake exports, 459
Oil-milling, 464, 563
Oil-palm, 536, 548, 555, 563
Oil-seeds, 563
Okiek : *see* Wandorobbo tribe
Ol Arabel (*or* Guaso Boli) R., 56
Olbolossat, L., 47, 48, 105, 366
Ol hulegelug : *see* Wytah-hazel
Ol Dogilani plains, 52
Ol Donyo Erok : *see* Erok, Mt.
Ol Donyo Guas, 83
Ol Donyo Mara, 51, 58, 84, 373
Ol Donyo Ngiro (*or* Sil), 58, 373
Ol Donyo Nyukie (Red Mountain), *or* Suswa, 53 54, 59, 103, 109, 186, 206, 223
Ol Donyo Sabuk, 38, 43, 44, 93, 95, 207, 385
Ol Ekunoni camp, 359
Ol Ekunoni pass, 42
Ol Emperasha Mts., 42, 359
Olive, grey, 184, 185, 188-190, 192, 194, 196, 201, 427
- Oma : *see* Uma, Mt.
Oman, Arabian district of, 239, 482-484
Omo R., 58
Ongalea Mts., 35
Opals, 111
Oranges, 219, 400, 402, 410, 522, 555, 562
Orchella lichen, 177
Oribi, 224
Orr valley, 84
Oryx, 202, 205, 208, 210, 228
Osman Gelli Maghan (chief), 251
Ostriches, 203, 206, 212, 442-443 ; ostrich farming, 203, 204, 212, 309, 442 ; hunting, 206
Ostrich-feathers, exports, 459
Osubogo Lo Loita, 63
Oswawembe : *see* Uso a Membe, Ras
Outeniqua : *see* Yellow-wood
Owen, Capt. W. F. N., 484
Owen Channel, 540
Owen Reef, 298
Owls, 204, 212
Owyombo R., 21
Oxen : *see* Bullocks
Oyoma Point, 319
Oyoma peninsula, 320
Ozi R., 22, 27, 287, 314, 353, 489
- P
- Pack transport, 366, 369
Pakka hill, 207
Palms, 20, 84, 173, 296, 370, 387, 404, 521, 522, 525, 528, 540, 554, 555
Palm-wine : *see* Tembo
Pandu, 215
Pangani R., 358
Pansa I., 539
Papa, 449
Paper manufacture, 115, 393

- Papyrus, 35, 48, 83, 170,
 174, 184, 208, 358, 548
 Parasites, 338
 Pare Mts., 11, 12, 15, 34,
 37, 349, 354, 355, 358
 Parrots, 212, 550
 Parsees, 512
 Passion-flowers, 549
 Pastoral pursuits, 246-
 248, 259, 261
 Pastoral tribes, 237, 430,
 431, 433, 434, 463,
 466, 477, 485, 504
 Pastoralists' Association,
 311
 Pasture, 46, 70, 77, 170,
 181, 182, 381, 388,
 394, 431, 432, 434,
 439
 Patta Bay, 24
 Patta I., 22-24, 30, 179,
 180, 289-291, 481,
 483, 489
 Pau, 200
 Pawpaw or Melon-tree,
 410, 553, 563
 Paza : *see* Faza.
 Peaches, 410
 Pears, 410
 Pearson, Colonel, 498
 Peas, 397, 423, 583;
 exports, 459
 Peete Inlet : *see* Uzi
 Channel
 Pelicans, 212
 Pemba Channel, 510
 Pembá I., 509, 510, 515,
 540
 administration, 516
 administrative dis-
 tricts, 536-538
 agriculture, 553-566
 area, 510-511
 bush, 535, 537
 cattle, 535
 cereals, 539
 climate, 124, 125, 128,
 136-141, 510, 535,
 544, 584-609, 641
 cloves and clove plan-
 tations, 534-537,
 539, 540, 542, 555-
 558
 coasts, 538-543
 coco-nuts and palm
 groves, 536, 537,
 539-541, 555, 559
 coral reefs, 538, 540,
 541, 542, 543
 fauna, 549-552
 geology, 534-535
 Government shambas,
 556, 557
 harbours, 538, 539,
 540, 541
 history, 481, 485, 497
 insect pests, 551
 labour, 557, 579
 law and justice, 516
 lepers, 541
 lighthouse, 542
 live stock, 566-568
 mango trees, 537
 mangroves and man-
 grove swamps, 534,
 535, 538-541, 544
 mosques, 512
 native tribes, 512
 physical features, 534
 -543
 population, 511-512
 potholes, 543
 raphia palms, 537
 religion, 512
 rice, 536, 537
 scrub-bush, 553
 slavery and the slave-
 trade, 536, 538,
 577-580
 swamps, 534, 535,
 537, 538, 544, 548-
 550
 vegetation, 535, 536,
 544-549
 water supply, 535,
 538, 539, 542
 Pemba Knolls, 542
 Pemba R. : *see* Cha
 Shimba R.
 Pencil cedar, 424
 Persia, trade with, 280
 Pea swamp, 48, 363
 Pete, 518, 519, 522,
 524
 Peters, Dr. Karl, 486,
 490, 491
 Petroleum products, im-
 portation of, 456
 Phlebotomus, or sand-
 fly, fever, 341
 Phoenix palm, 180
 Phonolite, 97-99, 100,
 106, 111, 117
 Pigaduri cattle quaran-
 tine station, 566
 Pigeon pea : *see* Congo
 pea
 Pigeons, 211
 Pigmy race, 233, 238
 Pigs, 208, 422, 439;
 wild, 553
 Pika Pika hill, 33, 92,
 353
 Pillar Rock, 298
 Pillar-wood, 188-191,
 193, 194, 201, 424,
 425, 428
 Pine-apples, 314, 397,
 410, 554, 555, 562
 Pine, Indian, 187, 188,
 194, 201, 427
 Pinkwood, 188, 200
 Pintail, 212
 Pipits, 213
 Plague, 316, 324, 334-
 336
 Plague and Cholera
 Ordinance (1907), 327
 Plane, Cape, 191, 193
 Plantations, 34, 67, 173,
 219, 297, 314, 384,
 402-407, 413, 415-
 417, 469
 Pleuro-pneumonia, 344,
 435, 438
 Plover, ringed, 212
 Pneumonia, 339
 Pneumonic plague, 335
 Poached ivory, 447
 Pochin Beach, 539
 Puko papyrus swamp,
 520
 Pokomo tribe : *see* Wa-
 pokomo
 Poles, timber, 426, 429
 Police Department, 471
 Police force, 476
 Poll tax, 474, 475, 503
 Polygamy, 245

- Pombe, 561
 Pomegranates, 410, 562
 Pongwe, Ras, 509, 531
 Ponies, 254, 464
Poon or *muna*, Ibean, 191
 Poplar, 180
 Porcupine, 209
 Port and Marine Department, 471
 Port Area, 281
 Port Cockburn, 536, 538, 540, 541
 Port Durnford (or Birkau River), 24, 78, 79, 180, 217, 292-293; communications, 293
 Port Florence: *see* Kisumu
 Port George, 538, 541
 Port Johnes, 25, 293
 Port Kishi Kashi, 541
 Port Kiuyu, 542
 Port Kwayama, 294
 Port Masindi, 350
 Port Reitz (Banderia Kipoyu), 20, 28, 29, 87, 278, 279, 283, 352
 Port Shamba, 25, 294
 Port Thenina, 294
 Port Tudor, 20, 21, 87, 278-280, 283
 Port Tula: *see* Arnoleh
 Port Victoria, 72, 269, 320
 Portal, Sir Gerald, 495, 497, 500, 503, 572, 578
 Portage, 203, 351, 364, 366
 Portuguese, 288, 290, 291, 481-482
 Portuguese East Africa, 418; trade with, 455
 Postal service, 471, 475. *See also* Runner mail
 Potatoes, 219, 387, 395, 397, 400, 413, 430; exports, 459
 Potholes, 523, 543
 Pottery manufacture, 289
 Poultry, 209, 289; poultry farming, 443
 Prawns, 215, 449, 450, 563
 Premier Mill, 424
 Printing establishments, 464
 Prison I: *see* Changuu
 Prisons Department, 471
 Protestant missions, 642
 Provincial Commissioner, 471, 473, 474
 Provisions, importation of, 454
 Public health, Ordinances and Rules concerning, 326-329
 Public Works Department, 98, 362, 471, 476, 479
 Puff-adder, 214
 Pulse, 395, 564; exports, 459
 Pumpkins, 554, 565
 Pungume I., 524, 525
 Puopo I., 532, 533
 Pwani Mchangani (Shangani), 530
 Pwani Ndongo, 513
 Pythons, 214, 550
- Q
- Quail, 211
 Quarantine Ordinance (1912), 327
 Quartz, 90-92, 114, 117, 120, 451
 Quinces, 410
- R
- Rabai, 312-313, 352, 465, 501, 502
 Rabai plateau, 29, 134
 Rabai tribe, 263
 Rahanwein (or Digil) tribe, 255
 Rainfall, 34, 49, 53, 57, 64, 75, 79, 98, 104, 110, 113, 126-128, 131-135, 137-142, 144-147, 149-169, 171, 175, 183, 190, 192, 195, 292, 302, 306, 316, 384, 385, 387, 412, 600-609
 Ramadi, 253
 Ramba tribe, 269
 Rambutan, 562
 Ramisi R., 19, 26, 28, 272, 350, 351
 Rams, 438
 Ramut, 15, 372
 Randili: *see* Rendile tribe
 Raphia palm, 180, 537, 548
 Rapids, 41, 42, 50, 81, 101
 Rare R., 176
 Rashid, Ras, 272
 Rats, 208-210, 326, 329, 335, 336, 550
 Ravine: *see* Eldama Ravine
 Ravine-Khamasia forest, 195
 Reata, Mt., 35
 Rebmann, Johannes, 484
 Red Mountain: *see* Ol Donyo Nyukie
 Red mullet, 449
 Red scale, 402
 Red Sea, 18, 96, 280, 367
 Redwater fever: *see* Texas fever
 Reed-buck, 205, 209, 226
 Reeds, 181
 Reef heron, 550
 Refuge Bay: *see* Kisumu Bay
 Relapsing fever: *see* Spirillary fever
 Rendile (or Randili) tribe, 82, 228, 234, 237, 238, 255, 259, 348, 371, 392, 463
 Reptiles, 213-214
 Rer: *see* under specific name
 Rest-houses, 309, 325
 Ret, 371
 Rheumatic affections, 340

- Rhinoceros, 202, 203, 205-209, 220; horn exports, 475
- Rhinoceros beetle, 403, 404, 552
- Rhodes grass, 422
- Rhyolite, 98, 105, 109, 111
- Riana R., 307, 369
- Ribe : *see* Rihe tribe
- Bibongazi R., 41
- Rice, 247, 271, 382, 390, 395, 398, 399, 421, 422, 524, 536, 537, 549, 555, 561; exports, 459
- Rift Valley, 12, 17, 18, 37, 42, 64, 75, 76, 91 agriculture and pastoral pursuits, 311, 387-389, 481, 436, 437, 440 communications, 348, 363-368 fauna, 203, 208, 211, 212, 220, 222, 225, 227, 231, 232 geology, 95-115 health conditions, 322 minerals, 112, 114, 393, 451 native population, 234, 237, 257, 260 physical features, 53-63 vegetation, 173, 174, 182-186, 194
- Rihe (Ribe) tribe, 263
- Rinderpest, 204, 221, 344, 433, 435
- Rio Umba, 509
- Ripon Falls, 167
- Riverain forests, 179, 180
- Roan : *see* Antelopes
- Boka, Gara, 14, 82
- Rollers, 550
- Roman Catholic missions, 276, 301, 306, 642
- Rombo R., 357
- Rongai R., 48
- Rose-apple, 562
- Royal East African steamship service, 282
- Royalties, 475
- Rovuma R., 487, 490
- Ruazi : *see* Smokyheart
- Rubber and rubber-growing, 177, 180, 193, 196, 200, 201, 289, 315, 382, 403, 413-414, 430, 460, 464, 536, 566; exports, 457, 459, 460, 475
- Rubja : climate, 126, 169, 584-601, 618-629, 632, 640
- Rudolf, L., 13-17, 51, 57, 58, 62, 75, 77, 84, 101, 103, 109, 122, 181, 213, 220, 221, 224, 237, 258, 259, 372, 373, 367
- Rudolf, L., district, 173 climate, 127 fauna, 210, 226, 228-230 nomad population, 430
- Ruff, 212
- Ruiru Falls, 98
- Ruiru R., 313, 360, 386
- Ruiru station, 313
- Ruizi valley, 122
- Rukinga hill, 33, 92
- Rumuruti, 48, 99, 359, 362, 363, 365, 366, 432, 464
- Rungumu sub-tribe, 255
- Runner mail, 303, 306, 308-310
- Ruri, Mt., 68, 319
- Rush, 198, 199
- Rusinga Channel, 69
- Rusinga (Lusinga) I., 68, 69, 118, 268, 393
- Ruwenzori, Mt., 166, 198
- Ruwu R., 12, 34
- 220, 256, 263, 285, 286, 352-354, 383, 417
- Sabaki valley, 88, 383
- Sabbu sub-tribe, 253
- Sable : *see* Antelopes, sable
- Sabugo Loldian, 60, 61
- Sabugo Rongai, 60
- Sadawabai, 536
- Saddle-bill, 212
- Sadler, Sir James, 507
- Safaris, 301
- Safraan, 189, 200, 428
- Sagalla, 33, 355
- Sagalla hills, 335
- Sagana R., 362
- Sahanga, Mt., 68, 319
- Said, Seyyid, 483, 484, 571
- Sainfoin, 422
- St. John's wort, 184, 198
- Saku, 82
- Sakuye tribe, 234, 256
- Sakwa : *see* Sawakwa tribe
- Sakwa's, 267, 268
- Salagli, 378
- Saleh sub-tribe, 255
- Saleita hill, 34, 356
- Salisbury bridge, 278, 283
- Salisbury, L., 122
- Salisbury, Lord, 500, 579
- Salt, 102, 103, 314; importation of, 456
- Salt R., 36
- Salt springs, 29
- Samanter Kalif, subsection of the Rer Abdullah, 251
- Samburu, 30, 33, 88, 89, 351, 353, 393, 463
- Samburu tribe, 51, 237, 238, 242, 245, 246, 255, 258, 259, 261
- Same, 358
- Samia district, 392
- Samia hills, 71, 116, 267, 320
- Sandalwood, 176, 183, 187, 196, 199, 200, 423, 425, 428
- Sandawi tribe, 233

S

- Sabaiyot : *see* Konyi tribe
- Sabaki R., 16, 21, 26-32, 88, 176, 213, 217, 218,

- Sanderson's Gulf, 57
 Sand-fleas : *see* Jiggers
 Sand-flies, 341
 Sand-fly fever : *see* Phlebotomus fever
 Sandgrouse, 210, 211
 Sandhills, 22, 23
 Sandstone, 85, 87-89, 119-121, 278
 Sango R., 13
 Sangu peninsula, 68
 Sangwiri tribe, 261
 Sanitation, 328, 331-332
Sansevieria, 179, 430
 Sardines, 215, 449
 Satima, Mt., 47, 48, 96, 100
 Sausage-tree, 183
 Savannah, 173, 175, 182-185, 210, 544
 Sawakwa (or Sakwa) tribe, 269
 Saw-fish, 449
 Saw-mills, 303-305, 308, 424, 464
 Scabies, 431, 438
 Schmalcalder Chain, 25
 Sclater, Capt., 364
 Sclater's road, 364, 366, 368
 Scrub, 179, 185, 188, 195, 296, 544, 553
 Sea-shells, 296; exports, 459, 475
 Secretary bird, 212
 Sedge-warbler, 213
 Seker, 76
 Seker, Mt., 75
 Sekoki : *see* Arabuko
 Sele Gubro Pass, 14
 Sembo tribe, 269
 Semi tribe, 269
 Senawe R., 21, 284, 498
 Sendait, 372
 Senecios, 198
 Senolait, 373
 Senya R., 359
 Serah, 371
 Serani, Ras, 275, 279, 281
 Serengeti, 34
 Serengeti plains, 34, 179, 348, 355, 356, 358, 383
 Serenli, 78, 81, 330, 331, 346, 347; communi-
 cations, 346, 377-379
 Serenli district, 217, 391; population, 250, 252, 581
 Sergoit, 366, 367
 Serut-flies, 341, 343
 Serval, 209, 210, 549
 Sesame : *see* Simsim
 Seven Forks Channels, 41
 Seyera swamp, 218, 343
 Seyidie Province, 274, 312
 administrative divi-
 sions, 581
 agriculture and live
 stock, 394, 443
 health conditions, 332, 334
 population, 581
 taxes, 474
 vegetation, 175, 178, 429
 Shaba, Mt., 50, 100
 Shaddock, 562
 Shaka, Ras, 22
 Shamba R. : *see* Tovai R.
 Shambas, 394, 402
 Shangani : *see* Pwani Mchangani
 Shangani, Ras, 513, 526-528
 Sharks, 215, 449, 569
Shauri wood, 180
 Sheep and sheep-farm-
 ing, 46, 76, 209, 247, 254-257, 259, 289, 310, 311, 385, 387, 388, 392, 431-433, 436-438, 444, 446, 463, 567, 568
 Sheep disease, 341-343, 345
 Sheep-skins, 447
 Sheikh ul-Islam, 474
 Shelford, Mt., 59
 Shell Transport Co., 282
 Shella, 23, 289
 Shera, Rer, subsection
 of the Rer Abdullah, 252
 Shihiris, 275
 Shikoku : *see* Arabuko
 Shimba Forest, 28
 Shimba hills, 26, 28, 29, 88, 89, 176, 177, 228, 263, 279, 351, 352
 Shimogr Rer, tribe, 257
 Shimoni, 19, 26, 86, 271, 272, 350, 351, 383; climate, 135, 137-141, 600-609, 612-613, 641
 Shirati, 66, 170, 318; climate, 169, 584-601, 608-609, 640
 Shirazian ruins, 530, 533, 539, 543
 Shirreh Jama (chief), 250
 Shombole, Mt., 52, 102, 364
 Shoveller, 212
 Shrews, 208, 550
Shughua, 201
 Shuka : *see* Chuka tribe
Siafu, or ferocious red driver-ant, 218
 Siddeh Dima, 90
 Siddima, 379
 Sil, Mt. : *see* Ol Donyo Ngiri
 Silk (raw) exports, 459
 Silk-cotton tree, 399, 422, 555, 565
 Silk monkey, 549
 Silkworms, 443
 Simba, 37, 95, 489
 Simbi, L., 68, 117
 Simpson, Professor, 331, 332, 345
 Simsim, 286, 289, 315, 389-391, 394, 395, 404, 414, 458; ex-
 ports, 459
 Siniongoni hill, 537
 Sio, 320
 Sio R., 13, 71, 116, 122, 320
 Sioko R., 116
 Sirgoit, Mt., 74
 Sirimi hill, 99, 363
 Sirra, 79

- Sisal and the sisal industry, 177, 273, 284, 381, 382, 384, 385, 387-9, 396, 398, 401, 409, 414-17, 430, 464; exports, 458, 459
- Sisini: *see* Sizini
- Situtunga, 208, 230
- Siyu (*or* Siu), 24, 290, 291, 483
- Siyu Channel, 23, 24, 290, 291
- Sizini (*or* Sisini), 542, 543
- Sizini Creek, 536
- Skate, 449
- Skin-disease, 340
- Skins, 309, 312, 432, 447, 569; exports, 458, 459, 475
- Slave-dhows, 530, 538
- Slavery and the slave trade, 289, 324, 466, 484, 488, 492-4, 498, 500-3, 555, 556, 557
- Slaves' Registration Department, 471
- Sleeping-sickness, 216-218, 319, 336, 337, 343, 435, 441, 442, 448; camps, 307, 330, 336
- Sleeping Sickness Ordinance (1909-10), 327
- Small-pox, 324, 340, 505
- Smith's Forest, 197
- Smith's Sound, 172
- Smokyheart, 188, 191, 200, 428
- Snags, 346
- Snake-bites, 340
- Snakes, 213, 550
- Snow, 46, 75
- Soap, 403, 453, 465; importation of, 456
- Sobat R., 122
- Soda, 52, 53, 100, 108-110, 364, 393, 450; exports, 459, 460; works, 363, 364
- Solai (*or* Kibibi), L., 55, 56, 60, 61, 107, 366, 388
- Solik tribe, 237
- Somali people, 233-235, 240, 246, 248-254, 259, 288, 291-293, 295, 297, 309, 312, 340, 391, 438, 442, 463, 464, 477, 504, 505
- Somali traders, 433
- Somaliland, 15, 487
- Sondo (*or* Miriu) R., 64, 66, 68, 110
- Songa tribe, 269
- Songat, Rer, subsection of the Tur Adi, 252
- Soot: *see* Sotik tribe
- Sosian R., 367
- Sotik: climate, 125, 160-163, 584-609, 612-615, 641
- Sotik district, 65, 66, 146, 208, 305, 342, 368, 388, 406, 412
- Sotik Forest, 186, 195
- Sotik R., 196, 208
- Sotik (*or* Soot) tribe, 260, 262, 505
- Sour-sop, 177, 562
- South Africa, trade with, 440, 445, 455
- South frontier: climate, 126, 130, 144-148, 584-629, 641
- South I. (*or* El Molo), 58
- Southern Reserve: *see* Masai Reserve
- Sowsow Point, 319
- Soya beans, 400
- Speke, Capt. J. H., 484, 485
- Speke Gulf, 170
- Spices, 564
- Spirillary, *or* relapsing, fever, 339, 340, 371, 372, 392
- Spirituous liquors, importation of, 455
- Spoonbills, 212
- Spur fowl, 211
- Squatting, 467
- Standard Bank of South Africa, 301, 304, 465
- Stanley, Sir H. M., 485
- Starlings, 213
- Steamers, 21, 22, 280-282, 285, 286, 289, 297-299, 316-320, 335, 346, 350, 465
- Stegomyia*, 216
- Steinbuck, 205, 224
- Stephanie, L., 14, 84
- Steppe, 178, 182, 184, 294
- Sting-rays, 449
- Stink-ant, 219
- Stinkwood, 188, 189, 191, 192, 200, 201, 428
- Stock-raising, 309, 387
- Stone pheasant, 211
- Stone quarries, 465
- Stony Athi, 42, 43, 309
- Storks, 212
- Storms, 132, 165, 166
- Strawberries, 410
- Strongylosis, 438
- Suam R.: *see* Turkwel R.
- Submarine cables, 274, 282, 527
- Sudan, 350; trade with, 462
- Suess, L., 109
- Suez Canal, 485, 571
- Sugar cultivation, 297, 313, 382, 384, 385, 391, 395, 397, 398, 417-418, 549, 565; exports, 459
- Sugota, L., 57, 109, 221
- Sugota R., 57, 103
- Sugota valley, 259
- Suk country, 76, 447
- Suk language, 239
- Suk Mts., 63, 75, 76, 227, 381, 389
- Suk plains, 62, 63, 75, 76, 367, 389
- Suk tribe, 76, 234, 237, 238, 241, 244, 249, 259-262, 463
- Suliman Habr, sub-tribe, 251
- Sulla, 422
- Sulphur, 90, 376
- Sultan Hamud station, 37, 38, 92, 95
- Sumatra, trade with, 456
- Sumba Channel, 71

Sumba I., 13, 71
 Sunbirds, 213, 550
 Suni, 205
 Suri Point, 319
 Surra, 566
 Surveys Department, 471
 Suspension bridges, 362, 368
 Suswa, Mt.: *see* Ol Donyo Nyukie
 Swahili language, 239
 Swahili people, 236, 239, 240, 263, 274, 275, 284-286, 288, 314, 325, 410, 464, 477, 498, 501, 505, 512, 525
 Swahili traders, 463, 484
 Swahililand, 489
 Swamps, 12, 22, 24, 26, 27, 34-36, 47-49, 56, 68, 69, 71, 78-80, 173, 174, 176, 177, 179, 184, 208, 365, 378, 545, 549-551, 555; swamp cultivation, 390, 395, 399, 422
 Sweden, trade with, 455
 Sweet potatoes, 394, 395, 413, 554, 565
 Sweetsop, 562
 Swine-fever, 204, 345, 439
 Sycamore figs, 183
 Syphilis, 340
 Szek, Teleki von, 485

T

Taarosero, clan division of the Masai, 258
Tabernamontana sp., 193
 Table Mountain, 79
 Taenia, 338
 Taita district, 179, 395, 421
 Taiti hills, 63, 76, 178, 186, 230, 367
 Takabba, 377, 378
 Takaungu, 21, 26, 87, 284, 382, 465, 498
 Takaungu district, 443, 449

Tallow-wood, 425
 Tamarind, 177, 201, 394, 395, 410, 428
 Tana 'broads', 27, 31
 Tana poplar, 428
 Tana plains, 202, 203, 382
 Tana R., 16, 18, 22, 26, 27, 30, 31, 38-42, 46-50, 94, 100, 176, 178, 214, 217, 220-229, 231, 233-235, 252, 256, 264, 265, 286-288, 347, 352, 353, 362, 363, 382, 383, 385, 487, 489-491
 Tana R. district:
 agriculture, 287, 397, 408, 414, 417, 418
 communications, 352, 353
 forest, 179
 health conditions, 321, 324, 329, 343
 population, 581
 Tana valley, 247, 263
 Tanaland Province, 245, 288, 314, 332, 480, 504
 administrative divisions, 581
 cultivation, 382, 395, 397, 408, 417
 fauna, 205, 215, 216, 222, 223
 fisheries, 449
 forest products, 430, 464
 population, 581
 taxes, 474
 vegetation, 175, 178
 Tandraa I., 293
 Tanga, 274, 349, 351, 358, 509, 510, 514, 575; climate, 138-141, 143, 146, 584-613, 616-629, 641
 Tanganyika, L., 17, 121, 484
 Tanganyika Territory (formerly German East Africa), 11-13, 35, 59, 95, 145, 257, 291, 300, 313, 316, 346, 349, 351, 357, 364, 392, 415, 481, 485-488, 498, 509, 551, 567, 575, 576
 Tannin, 383, 419
 Tanning bark, 397, 418
 Tanning industry, 453, 465
 Taro, 565
 Taru desert, 28, 30, 37, 89, 92, 134, 228, 233, 256, 383, 415; communications, 353-354
 Taru Grits sandstone, 89
 Taru hills, 33, 89, 353
 Tase, 449
 Taveta, 34, 35, 92, 93, 313, 357, 358, 383
 climate, 145, 146, 600-605, 641
 communications, 93, 313, 354, 356
 Taveta district, 177, 213, 227, 263, 321, 335
 Taxation, 474-475
 Tea, 422; importation of, 456
 Teak, 425; East African, 177, 200, 427; Ibean, 201, 427
 Teff grass, 422
 Teita district, 32, 33, 37, 383; population, 581
 Telegraph service, 274, 282, 285, 287, 295, 314, 475
 Teleki's volcano (*or* Luburua), 58, 103
 Telephone service, 274, 284, 286, 288, 300, 312, 314
 Tembo, *or* tembo-tembu (palm-wine), 324, 325, 402, 403, 417, 559
 Tembo-kali, 403
 Temperature, 124-126, 131-136, 143-145, 148, 149, 155, 156, 160, 161, 164, 167, 168, 584-599
 Tengesi: *see* Barracuda
 Termites, 210, 218, 552

- Texas, *or* Redwater, fever, 342
 Theraka country, 363
 Thegana R., 47
 Thenina I., 294
 Theraka tribe: *see* Atheraka
 Theziger, Col., 250
 Theuka, Mt., 33
 Thiba R., 41
 Thika, 300, 314, 348
 Thika district: cultivation, 396, 406, 415, 417
 Thika plains, 207
 Thika R., 38, 41, 42, 45, 94, 95, 220, 314
 Thomson, Joseph, 485
 Thomson's Falls, 48
 Thorn bush, 35, 36, 178-181, 183, 208, 385
 Thowa R.: *see* Thua R.
 Thrips, 407
 Thua (*or* Thowa) R., 32
 Thunderstorms, 128, 144, 148, 150, 154, 159, 163, 167, 316
 Tick-birds, 212
 Ticks, 203, 216, 219, 339, 341, 342, 360, 552
 Tigrish (*or* Tigeri) R., 56, 65, 72, 110, 111
 Timber, 64, 73, 174, 176, 180, 183, 185, 186, 189, 191, 195-197, 199, 309, 389, 419, 423-429, 488; royal-ties, 475
 Timu (*or* Utimu) tribe, 269
 Tindaret volcano, 72, 111
 Tindoret forest, 195
 Tiriki country, 266, 267
 Tits, 213
 Tiva R., 31, 32
 Tiwi, 87, 273, 350, 382
 Tobacco, 219, 382, 399, 418, 523, 537, 553; exports, 459
 Tomatoes, 554, 565
 Tomia, son of Sakwa (chief), 268
 Toowoomba, 422
 Tope-tope, 547
 Topeisa, Gara, 82
 Topi, 205, 210, 222
 Tortoise-shells, 570; exports, 459
 Totems, 245
 Tovai (*or* Tuala) I., 25, 294
 Tovai (*or* Shamba) R., 25, 294
 Town magistrates, 473
 Townships' Sanitary Rules and Ordinances, 303-306, 308-313, 327, 342
 Trachyte, 98, 101, 106, 111, 114
 Trade routes, 339
 Tramways, 361, 375
 Trans-Nzoia district, 74, 332, 367
 Transport, 297, 307-309, 348, 369, 389, 421, 442
 Transport Department, 471
 Treasury Department, 471
 Tree-cobra, 213
 Tree-ferns, 188, 197
 Tree-grounsels, 198
 Tree-health, 199
 Tree-hyraxes, 208
 Tree-moss, 193
 Trees, 173-200; reserved, 200-201
 Trolley service, 276, 277, 299
 Trout, 214
 Trypanosomiasis: *see* Sleeping-sickness
 Tsavo district, 220
 Tsavo R. 30, 32, 35, 36, 40, 91, 95, 180, 206, 214, 354-357, 383, 384
 Tsavo station, 33, 93, 354, 356, 357
 Tsetse-fly, 216-218, 313, 321, 336, 337, 341, 343, 348, 349, 357, 358, 373, 374, 391, 442, 551
 Tuala I.: *see* Tovai I., 294
 Tuberculosis, 340
 Tuff, 97, 98, 100, 104, 110, 111, 118
 Tuken: *see* Kamasia tribe
 Tula I., 293
 Tulha, Rer, subsection of the Marehan Rer Isaak, 251
 Tulimani hill, 451
 Tumalods tribe, 248
 Tumara, 193
 Tumbatu I., 511, 518, 529, 532-533, 545, 568
 Tumbini, 537
 Tumutumu, 330
 Tuna, *or* albicore, 215
 Tundana, Ras, 536, 539, 540
 Tungi, 486
 Tungu: *see* Ants
 Tunguu, 522
 Tungwe, Ras, 541
 Tur Adi, division of the Aulihan, 252
 Turacos, 212
 Turbi, Mt., 82, 372
 Turkana district, 76, 178, 225, 230, 367, 381, 447; population, 581; sheep, 436
 Turkana language, 239, 260
 Turkana tribes, 76, 77, 237, 238, 241, 246, 249, 259-260, 262, 463, 505
 Turkwel (*or* Suam) R., 13, 63, 75-77, 222, 226, 260, 367, 368
 Turkwel valley, 122
 Turnong, 371
 Turoka, 97
 Turtle, 569
 Turtle dove, 211
 Tussock grass, 198
 Twigg's Post, 364
 Typhoid, 316, 338, 340

U

- Uaraguess, Mt., 40, 221
 Uasin Gishu district :
 climate, 158
 communications, 311, 348, 389
 cultivation, 388, 389, 396, 402, 406, 409, 411, 420
 education, 478
 fauna, 203, 226, 229, 230
 health conditions, 322, 332
 live stock, 431, 436, 437, 439, 440, 441
 population, 581
 proposed railway, 311, 389
 vegetation, 182, 185
 Uasin Gishu division of the Masai, 257, 258
 Uasin Gishu plateau, 71, 73-75, 111, 112, 114, 115, 173, 183, 196, 248, 304, 308, 348, 366, 386, 399
 Uasin Gishu R., 195, 220, 224
 Uaso Narok R., 207
 Ucinia, 198
 Uganda, 13, 14, 75, 76, 317, 350, 396, 407, 408, 421, 422, 425, 490, 492, 495-497, 499-501; customs, 475; trade, 316, 452, 462
 Uganda Railway, 28, 30, 32, 33, 36, 38, 44, 55, 59, 62, 64-67, 72-74, 85, 91, 116, 134, 175, 186, 199, 206, 207, 216, 217, 274, 277, 281, 300, 303, 305-308, 310, 311, 315, 317, 343, 346, 348, 350, 351, 353, 356, 357, 359, 361, 364, 365-368, 383, 388, 393, 415, 424, 440, 452, 461, 465, 470, 471, 475, 476, 500-501, 576
 Ugas Ouled, Rer, subsection of the Rer Abdullah, 251
 Ugingo Is., 13
 Ukamba hills, 31
 Ukamba Province, 37, 47, 299, 307, 309, 385
 administrative divisions, 581
 health conditions, 332, 334, 340
 population, 581
 taxes, 474
 trade, 464
 vegetation, 175, 178, 182
 Ukanga I., 525
 Ukerewe I., 170
 Ulu, 36, 38, 97, 207
 Ulu district, 264, 309, 410, 505
 Ulu hills (*or* Iveti Mts.), 38
 Uma (*or* Oma) Mt., 268
 Umba R., 11, 16, 18, 19, 26, 270, 271, 349-351, 382, 487
 Ungelli : *see* Lougelli
 Unguja Mkun, 525, 555
 Union Castle Steamship Company, 282, 515
 United Kingdom, trade with, 402, 417, 419, 440, 445-447, 450, 454, 456-458, 460
 United States, trade with, 454, 456-458, 460
 Unsi, 78, 379
 Unter Kahe, 313
 Upembe Channel, 539, 543
 Upembe, Ras (Nassoon Point), 538
 Uran, 14, 81
 Ursulli, 14, 15
 Urua, Ras, 531
 Ururaha swamp, 181
 Usambara district, 126
 Usambara Mts., 11, 15, 37, 358
 Usambara Railway, 354, 358
 Usarama, 498
 Usembo (Asembo) Bay, 318, 320
 Usembo village, 320
 Useri post, 12
 Usgara country, 486
 Usindja, 166, 170
 Uso a Membe, Ras, (Oswawembe), 528, 529, 532
 Ussukuma, 170
 Usui district, climate, 166
 Utimu : *see* Timu tribe
 Utwani forest, 27, 176, 382
 Uvel, L., climate, 164
 Uvinje Gap, 540, 541
 Uvinje Is., 541
 Uwanga : *see* Arrowroot
 Uyoma peninsula, 68-70
 Uyoma Point, 68, 71, 116
 Uyoma tribe, 269
 Uzi Channel (Pcete Inlet), 518, 519, 524, 545, 555, 563
 Uzi I., 511, 525, 533-534
 Uzini, 518, 521, 522

V

- Vaccination Ordinance (1912), 327, 340
 Vaita : *see* Manda, Mt.
 Vanga, 19, 26, 270-271, 351, 382
 Vanga district, 26, 28, 351
 cultivation, 382, 383, 402
 fisheries, 449
 health conditions, 321
 population, 271, 581
 Vanilla, 564
 Varaguess, Mt., 51
 Vasco da Gama's Pillar, 21, 286
 Vegetables, 271, 289, 297, 298, 306, 307, 391, 395, 453, 565

Veldt sores, 340
 Venereal disease, 324, 340
 Venyandet, section of
 Lago tribe, 261
 Veterinary Department,
 341, 432, 471
 Victoria Nile, 122
 Victoria Nyanza, 12, 13,
 17, 37, 64, 66, 67, 69,
 71, 75, 106, 110,
 112, 122, 123, 182,
 216, 227, 230, 266,
 309, 369, 407, 412,
 417, 451, 461, 462,
 467, 485, 487, 488,
 492, 499-501, 505,
 575, 576
 fishing, 214, 448,
 546
 levels, 166
 steamers and motor
 launches, 335, 350,
 465
 tides, 167
 winds, 165, 167
 Victoria Nyanza dis-
 trict:
 climate, 126, 128, 129,
 146, 160, 163-172,
 584-633, 636, 640
 communications, 368-
 369
 cultivation, 381, 389-
 390, 421
 fauna, 203
 geology, 115-123
 health conditions, 321,
 336
 native population, 235
 towns and ports, 315-
 320
 See also Nyanza Pro-
 vince
 Vigna beans, 564
 Vilima Viwili, Mt., 35,
 358
 Village Headmen Ordi-
 nance (1902), 503
 Vinyo escarpment, 70,
 120, 390, 392
 Vipers, 213, 214, 550
 Vitengeni, 29, 352

Vitengeni R. : *see* Fula-
 doyo R.
 Vitongoge, 537
 Voi, 33, 93, 179, 186,
 313, 330, 335, 337,
 383, 384
 climate, 128, 144-146,
 584-609, 641
 communications, 313,
 349, 354-356
 Voi district, 321, 384,
 395, 415
 Voi Forest, 180
 Voi R., 32, 34, 92, 180,
 214, 285, 354
 Volcanic region, geology
 of, 95-115
 Volcanoes, 17, 39, 49,
 52, 53, 55, 91, 95, 96,
 99, 102-104, 106, 107,
 110, 111, 119
 Vultures, 204, 211
 Vundwe (Wundwi) I.,
 525, 534

W

Wabaiyu, 181
 Wachulu : *see* Awaware
 Wadabira tribe, 34
 Wadelai, 122
 Waders, 203
 Wadigo tribe, 28, 271
 Wafattu, Rer, subsection
 of the Rer Mumin
 Hassan, 252
 Wagalla sub-tribe, 254
 Wages, 401, 416 ; rates
 of, 469
 Wa-Giriama tribe, 244,
 465. *See* Giriama
 tribe
 Wagtails, 213
 Wahadimu tribe, 512,
 524, 525, 530, 531,
 533, 562
 Wahehe tribe, 258
 Wait-a-bit bush, 179,
 181
 Waiye, 372
 Wajheir Bor, 377
 Wajheir district, 78, 90
 96, 101, 296, 298,

363, 375-378, 391,
 442, 464
 native population,
 252-254, 257
 wells, 78, 82, 464
 Wajheir Moyale, 82
 Wakamba : *see* Akamba
 tribe
 Wakh lands, 477
 Wakhitsetse clan, 268
 Wakitoto tribe, 268
 Walangulu (*or* Arian-
 gulu) tribe, 233, 256
 Wamia (*or* Etossio *or*
 Elgumi) tribe, 260,
 267
 Wandorobbo (*or* Okiek)
 tribe, 233, 234, 236,
 246-248, 258, 260
 Wanyamwezi tribe, 477
 Wanyika tribe, 235, 263
 Wapemba tribe, 512,
 535, 538, 543
 Wapokomo tribe, 235,
 236, 241, 244, 247,
 249, 263, 464
 Wardeh (*or* Wurde)
 tribe, 234
 Warsangeleh, division of
 the Herti tribe, 253
 Warsheik, 486, 487, 490
 Wart-hogs, 204, 209, 231
 Wa Sania tribe, 233,
 235, 246, 248, 256,
 263
 Wasein (town), 271-272
 Wasein harbour, 19, 272
 Wasein I., 19, 26, 271-
 272
 Wasps, 218
 Wateita tribe, 263
 Water-buck, 208, 225,
 226
 Waterfalls, 30, 41, 42,
 45, 48, 50, 69, 75, 93,
 94, 98, 101, 314, 386
 Waterfowl, 203, 212
 Water-lilies, 177, 184,
 537
 Water-plants, 549
 Water-supply : as affect-
 ing health conditions,
 321-345 ; of towns

and settlements, 270-320; water - holes, wells, springs, and running water of the country, 29-84, 346-380
 Waterways, navigable, 18, 19, 21-23, 25, 31, 81, 346-347, 378
 Watiku tribe, 292, 293
 Watta tribe, 233
 Wattle, 308, 381, 388, 418-19; exports, 459, 461
 Watumbatu tribe, 530, 533
 Wawanga tribe, 235
 Wayimbo tribe, 269
 Weaver birds, 212, 550
 Webe Dawa R., 372, 379, 380
 Wedshano, Ras, 532
 Weevils, 412
 Wegieda, Rer, subsection of the Marehan Rer Isaak, 251
 Weichaga, 330
 Wei Wei R.: *see* Keru R.
 Werakai (chief), 261
 Western Highlands: physical features, 63-77
 Weti, 534, 535, 541
 Weti Bay, 541
 Weti Creek, 541
 Weti district, 516, 536
 Weti Harbour, 538, 541
 Wheat, 62, 309, 388, 389, 394, 397, 409, 420-421, 453
 Wheat aphid, 219
 Wheatear, 213
 Whimbrel, 212
 White-throat, 213
 Whydahs, 212, 550
 Wild animals, exports, 459
 Wildebeest, 205, 206, 209, 222
 Wild-fowl, 206, 213
 Willow-warbler, 213
 Wimbi, 394, 412

Winds, 101, 129-130, 135, 136, 142-144, 148, 151, 155, 159, 160, 165-167, 171, 172, 619-639
 Wingwood, 191, 193, 194
 Wireless station, 536
 Wissmann, Major von, 498
 Witu (town), 27, 217, 314, 413, 489-491; communications, 314, 353
 Witu, Sultanate of, 27, 314, 489, 495, 496
 climate, 126
 fauna, 214, 215, 224
 health conditions, 218, 344
 population, 581
 vegetation, 176, 382
 Witu Company (German), 490
 Woth's grass, 422
 Wood exports, 459
 Wood-hoopoe, 550
 Wood-pecker, Zanzibar, 550
 Wood-pigeon, 211
 Wool, 432, 436, 437, 446-447, 459
 Wundwi: *see* Vundwe I.
 Wurde: *see* Wardeh tribe
 Wytych-hazel, 196

Y

Yaben (*or* Dagodia *or* Dagodia Fai) tribe, 257
 Yakob Habr sub-tribe, 251
 Yala, 335
 Yala (*or* Lukos) R., 71, 216, 266-268, 334, 339, 368
 Yala road, 316
 Yala swamp, 71
 Yambugomi Creek: *see* Kingoji Bay
 Yams, 565

Yatta plains, 182
 Yatta, 31
 Yatta plateau, 36, 38-40, 94-96, 264
 Yaws (Framboesia), 340
 Yeketekambe, Ras (*or* Makita, *or* Mkita), 526, 555
 Yellow-wood, 174, 184, 188-194, 196, 201, 423-425, 429
 Yew, African, 188
 Yimbo (*or* Jimbo) R., 19, 270, 271
 Yombi I., 539
 Yonti, 78, 81, 180, 295, 299, 346, 391
 Young Men's, and Young Women's, Christian Associations, 479

Z

Zaichu, 363, 375
 Zambezi R., 96
 Zanzibar Channel, 509, 525, 534
 Zanzibar I., 338, 482-486, 497, 509, 510
 administration, 515-516
 agriculture, 553-566
 animal products, 569-570
 area, 510-511
 beeswax, 569
 bush savannah, 544, 547-548
 caves, 526
 chillies, 561-562
 cloves and clove plantations, 513, 519, 521, 522, 524, 553, 554, 556-558
 coasts, 524-532
 coco-nuts and palm groves, 513, 521, 522, 524-526, 528-532, 552-556, 559-560
 communications, 274, 280, 282, 283, 574, 575

Zanzibar I. (*contd.*):
 coral, 513, 518-520,
 523, 530, 531, 532,
 547, 553
 date groves, 521
 fauna, 528, 549-552
 fisheries, 568, 569
 fruits, 562-563
 geology, 518-519
 Governmentshambas,
 556, 557
 Governmentsteamers,
 515
 harbours, 575
 insect pests, 551
 labour, 579
 lagoons, 519, 528
 law and justice, 516
 lighthouse, 526, 528
 light railway, 514, 528
 live stock, 566-568
 mango trees, 532
 mangroves, 513, 525,
 528, 544-545
 marine and fresh-
 water fish, 550-551
 native cultivation,
 554, 556, 560-566
 native tribes, 512
 passes, 527
 physical features, 519-
 532
 population, 511-512
 quarantine and isola-
 tion station, 528
 religion, 512, 513
 rice, 555, 561
 roads, 514
 scrub bush, 544, 547,
 553
 slavery and the slave
 trade, 554, 556, 557,
 577-580
 stone quarries, 570
 streams and springs,
 520, 526, 528, 529
 submarine cables,
 274, 282, 527, 528

swamps, 520, 522, 544,
 545, 548-551, 555
 trade, 291, 450, 458,
 461, 510, 512, 514
 vegetation, 544-549
 Zanzibar Protectorate
 (now the Kenya
 Protectorate):
 administration, 515-
 516
 area, 510-511
 British protectorate,
 515, 571-580
 fauna, 549-552
 coinage, 517
 consulates, 571
 District Commission-
 ers, 515-516
 general description,
 509-517
 government, 515-516,
 572-573
 High Commissioner,
 515
 history, 571-582
 imports and exports,
 516, 570, 576
 industries, 553-570
 land tenure, 517
 physical geography,
 518-543
 population, 511-513
 Resident, 515, 573
 revenue, 516-517
 shipping, 570
 slavery and the slave
 trade, 501-503, 510,
 573, 574, 576-580
 trade and commerce,
 284, 285, 297, 574-
 576
 vegetation, 541-549
See also Pemba I.;
 Zanzibar I.; Zanzi-
 bar, Sultan of
 Zanzibar, Sultan of, 239,
 484-486, 489, 491;
 abolition of slavery

under the, 501-503;
 authority of, 515;
 territories leased by,
 295, 472, 477, 487;
 488, 490, 493-496. *See*
also Zanzibar Protec-
 torate.
 Zanzibar town (Port
 Zanzibar), 483, 513-
 515, 519-522, 526,
 531, 545, 550, 551,
 554, 559, 563, 567,
 569
 area, 513
 cable communica-
 tions, 274, 282, 514-
 515, 575
 climate, 124, 129, 136-
 143, 146, 584-613,
 618-629, 641
 fishing industry, 569
 harbour, 510, 514-515,
 524, 527
 hospitals, 513
 institutions, 513
 missionary centre, 513
 mosques, 513
 native schools, 513
 population, 511
 railway, 528
 sanitation, 513, 566
 steamship communi-
 cations, 574-575
 stone quarry, 570
 suburbs, 513, 529
 transit trade, 514, 571,
 574-576
 Zebbras, 202, 203, 209,
 210, 221, 348, 349,
 438, 439
 Zigadi I., 294
 Zigzag Pass, 298
 Zimberao, 562
 Zingwe Zingwe (Mzingwa
 Mzingwa) R., 519, 520,
 522, 528
 Ziواني swamp, 35, 356,
 357

